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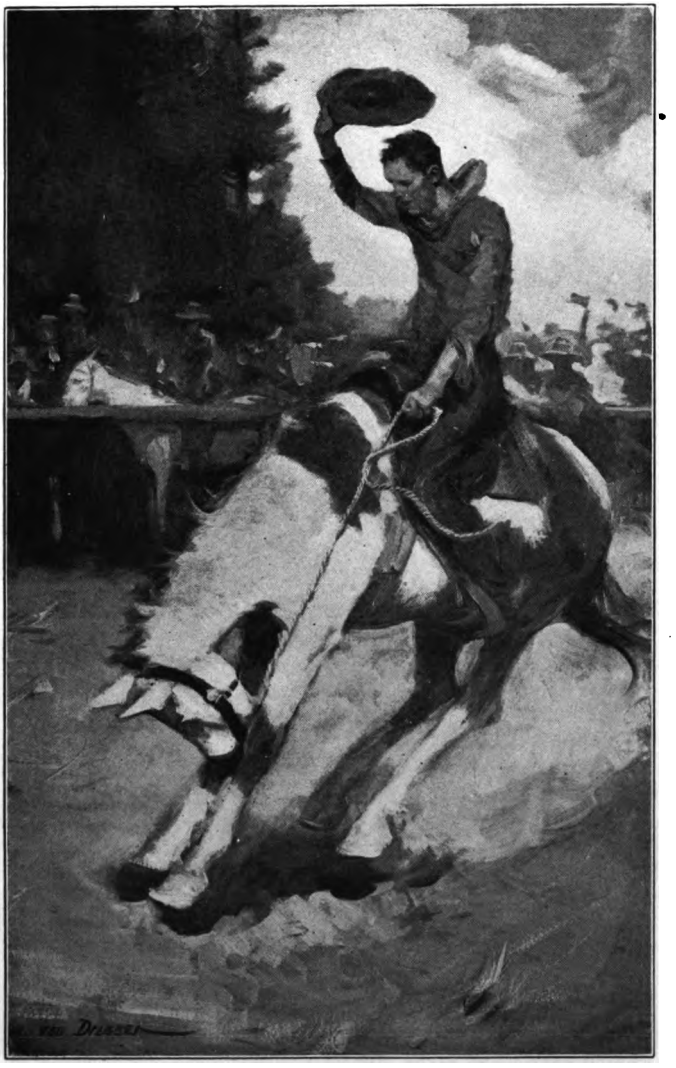

Spitfire began to double in his best bucking form.

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UNEXPLORED!

BY

ALLEN CHAFFEE

Author of "Lost River, the Adventures of Two Boys in the Big Woods," "The Travels of Honk-a-Tonk," "Twinkly Eyes" (3 vols.), "Fleet-Foot," "Trail and Tree Top," and "Fuzzy Wuzz, the Little Brown Bear of the Sierras."

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WILLIAM VAN DRESSER

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TO

H. F. B.,

Who would still be a boy,

Were he a thousand years of age.

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INTRODUCTION

A PACK-BURRO camping trip in an unexplored region of the high Sierras results in a series of adventures for three boys in the late teens, a young Geological Survey man and the old prospector who guides them.

They meet bears and catch rainbow trout, are carried to fight fire by the Forest Service Air Patrol, and trail the incendiaries through a labyrinthian limestone cave. They ride in a lumber camp rodeo and experience earthquakes and avalanches. And in the glacier-gouged canyons, the giant Sequoias, and sulphur springs, they trace the story of the geological formation of the earth, and its evolution from the days of dinosaurs.

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UNEXPLORED

CHAPTER I

THE RODEO

TED SMITH, flinging his long legs off a frisky bay, grinned delightedly as his eye caught a flag-decked touring car.

"Are you riding?" called the boy at the wheel.

"Sure AM!" drawled the ranch boy. "How about yourself?"

"Betcher life, Old Kid!" Ace King flung himself to the ground, disclosing the fact of his new leather chaps—a contrast to Ted's overalls. Greetings followed between Ted and Senator King in the back seat, and Pedro Martinez, a black-eyed young fellow who sat a pinto pony alongside.

The slanting rays of California sunshine were fanned by a breeze from Huntington Lake, as the crowd sifted about the corral fence at Cedar

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Crest. The prevailing khaki of the dusty onlookers gave way at intervals to a splash of color. An Indian in a purple shirt was borrowing the orange chaps of another bronchobuster; he had drawn number two from the hat. Most of the cowmen offset their "two-quart" sombreros with brilliant-hued bandannas knotted loosely at their throats. A few wore chaparreras in stamped leather, and a few in goatskin—red or black or tan—though most let it go at plain blue overalls. One of the machines drawn up beside the soda-pop stand fluttered a flag on its nose. For the Fourth was to be marked by a reading of the Declaration of Independence before the rodeo and barbecue. (The day had begun with a Parade of Horribles, in which every last lumberman took part, chanting the marching song to an accompaniment of well-belabored frying-pans.)

Unbidden, a band of unspeakably unwashen Digger Indians, attired in gay and ill-assorted rags, appeared, and seated themselves on the opposite hill-side, beaming vacuously as the ox was put in the pit to roast, (together with two smaller carcasses that the camp cook winkingly designated as wild mutton, though he was care-

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ful to bury the antlers against the possible advent of the Forest Ranger).

The rodeo master, a megaphone-voiced blond giant, in high-heeled riding boots and spurs that made him limp when he walked, careened up and down the dusty field on a high-stepping bay, while two lasso men in steel-studded belts and leather cuffs helped round the range stock into the adjoining small corral.

An unbroken two-year-old with wild, rolling eyes tried to climb the fence when the rope tightened on his throat, and a sleek mule kicked out in a way that left a red mark on the flank of a lean white mare. Then one of the bulls in a separate corral shoved his head under the lower of the two log bars that fenced him in and lifted—lifted,—but could not break through.

"Riding, old Scout?" Ted asked the young Spanish-Californian.

" 'Fraid I'd ride the ground," admitted Pedro, with a gesture of his plump, manicured hands.

"Yeh!—Saw-horse's HIS mount!" jollied Ace, though the pinto looked by no means spiritless. (And to himself he added: "Likely promised his mother not to. Gee! I'd like to

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cut him loose from her apron strings for about three months and see how he'd pan out!")

"*He's* got too much sense to risk his bones," championed the Senator, (a heavy, florid man with a leonine mass of white curly hair and Ace's daring black eyes).

Just then a petite young woman rode up, her bobbed curly hair and sun-flushed cheeks topping a red silk blouse joined to her khaki riding breeches by a fringed sash that reached half way to her elkskin boots.

"I say, Rosa, are you riding?" greeted Ace. The girl shook her head merrily. "Dad, that's Pierre La Coste's sister,—you know, he's fire-lookout on Red Top. Used to be one of our Scouts when we lived in Peach Cove."

"Yeh, we used to call him Pur-r-r," supplemented the ranch boy.

"And that's the horse Ranger Radcliffe's been trying to give her," added Ace, sotto voce. "Isn't he a beauty?"

"And she won't have him?" laughed the Senator.

"Won't have man or beast."

Ace, now studying geology at the University

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of California, though he had traveled widely since the old ranch days, still counted Ted, sandy haired, thin and freckled, struggling to make his mother's fruit ranch a go, his chum. Pedro, a neighbor of the old days, was his roommate in the fraternity house at Berkeley. All three ran to greet Norris, a young man in the uniform of the U. S. Geological Survey (son of the Forest Supervisor), who now appeared, galloping beside Ranger Radcliffe. For he was to pilot them on a camping trip into the high Sierras in a week or two.

The first entry was just being led forth to be saddled as the fifth and final member of their expedition arrived on the scene, afoot,—Long Lester, a lanky, bewhiskered old prospector in soft felt hat, clean but collarless "b'iled shirt," vest, cartridge belt and corduroy "pants," thrust into the tops of ordinary hob-nailed boots.

"Well, you broncho-busters, out in the center!" megaphoned the man on the big bay. "Five more riders here!—Two-fifty to ride and seven-fifty more to go up!" Three men came forward. "We want two more entries. If you

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pull-leather or fall off, two-fifty. If a fellow rides a bull with one hand hold, he gets seven-fifty. Ten dollars if you go up!"

Ace and Ted exchanged glances as they started forward.

"You're sure courtin' trouble," called the Senator.

"I reckon I am," grinned Ted, "but I'm broke."

"You'll have to pay your winnings to get your bones mended."

"I'll take a chance!"

King laughed. Most of the horses he recognized as having been ridden before. But he was secretly resolved if Ace drew a bad one, to exercise his parental authority.

The chums drew from the hat, Ace taking the last name. He started as he looked at his slip. "The white-faced bull," read Ted over his shoulder.

"Gee! Don't tell Dad!" breathed Ace. "What's yours?"

"Spitfire!"

The older boy emitted a long-drawn whistle.

"All right, broncho boys," megaphoned the starter.

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The first entry, rearing and snorting, with two lassos about his neck, had finally been blind-folded and caparisoned.

"Johnny White from Fresno, on Old Ned from Northfork," rang the announcement. An Indian in overalls swung himself into the saddle simultaneously with the snatching away of lassos and blinders.

The horse tucked his head almost between his knees, and leaped into the air, bowing his back and grunting with each jump, while the dust rose till no one could tell whether the rider was on or off. Then the horse galloped to the opposite side of the corral and his unwelcome incumbent was perceived picking himself sheepishly out of the dust.

"Henry Clark from Table Mountain, on the pinto from Cascada," the next entry was shortly announced. The Indian in the purple shirt stepped forward, gorgeous in his borrowed chaps.

"Some buckaroo!" grinned Ted.

The pony, not quite so thin as most of the range stock, blinked startled eyes, and the fireworks began. The gorgeous one, barely surviving the first buck, and seeing himself riding

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for a fall in all his finery, leapt nimbly to the ground while the pony went on bucking. He landed right side up—with no damage to the purple shirt. A derisive jeer greeted this—fiasco.

"He sure wasn't goin' to dust them ice-cream pants," laughed one of the crowd hanging over the fence. The Indian signified a desire to try again. After a couple more riders were called, he was given the same mount again.

This time he saved his finery by grabbing hold with both hands.

"Pulling leather only gets two-fifty," adjudged the megaphone man.

"He sure had a good hand hold," gurgled Ted. "Pretty hard on the wrists, isn't it, Henry?"

"Wait till we get you a medal!" boomed Ace.

Next came a white rider, who won the nickname "Easy Money" by riding a mule up with a surcingle, then another Indian,—they were mostly the youngsters working on local pack-trains,—who began by straddling the neck of his mount and ended by going over the animal's head, landing flat on his back. A momentary

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hush, and the fence lizards began collecting around the limp form. The Indian's round brown face had turned gray.

"Stand back and give 'm air," megaphoned the starter, fanning him with his hat. Some one brought water, then the Indian opened his eyes, and presently signified a desire to get up. He was helped to his feet. "He's all right," was the final verdict as the little group led off the field. "Somebody give 'm a cigarette." The Indian leaned against the corral fence nonchalantly, lighting up, though with fingers that shook the flame out of several matches.

"Gee!" nudged Ace. "Dad's motioning us, and if he knows I've drawn that bull, he'll sure——"

"You're nineteen."

"Aw, he's the Gov'ner, just the same. If you had one you'd see. Let's stick here behind this bunch till my turn comes 'round."

"Sure you'd better try it?" Ted laid a hand on his chum's shoulder.

"Sure thing! What's the use of living if you never take a chance? Besides, you've got a reg'lar rocking-horse yourself, huh?" he scoffed.

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"That's all right, I was born ridin'," Ted made light of it.

It was now time for the bay bull. As a saddle swings around on anything but a horse, it is easier to ride bulls and mules with a surcingle. It took three men to get the bull into the saddling pen, two with lassos and one with a pole, but the strap was finally adjusted around his chest, and the mount made.

One Shorty Somebody was the rider. And Shorty rode him,—stuck clear across the corral. But there the bull torpedoed the middle log of the fence and went straight through, scraping Shorty off.

Straight into a startled ring of spectators plowed the enraged beast, sending horses whirling and pedestrians dodging for their lives. The petite Rosa's mount got to dancing, and finally staged a petite runaway on his own account, but Rosa kept her head and a tight rein. A small boy scrambled into a low-branching tree. But three lassos and a dozen mounted men finally headed off the bull and got him into a smaller corral.

Ted looked inquiringly at Ace, but the Senator's son evidently had his blood up. The

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white-faced bull, meantime, was again trying to thrust his massive shoulders beneath the lower bar.

Two mules came next on the program, one rider bringing his mount to terms so quickly that people were laying bets it was just a pack-mule, while the other stuck when his jumped the fence.

Ranger Radcliffe, galloping back beside Rosa's now docile mount, waved a hand to the boys. Then a murmur rippled through the loungers that encircled the corral, as the white-faced bull was called for. Ace's nerves began to tingle.

This bull had been kept in close confinement for several days past, and it had not improved his temper. They had to throw him to put on the straps.

"Hold him!—Hold him!" at intervals percolated through the hum of voices, as the great brute lay panting in the saddling pen, his eyes ringed with infuriated white, his snorting breath—audible thirty feet away—sending spirals of dust scudding before his nose.

"Well, what do you say? Say it quick! I'm betting on the bull," King was challenging

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the Ranger, little dreaming who the rider was to be.

This bull was to be ridden with a saddle and one hand hold. The gate of the saddling pen cracked as its occupant tried to rise.

"You folks around the fence, you had better look out!" megaphoned the starter. "This 'ere bull may not look where he's a-goin'!"

The gate cracked again. A woman nearby screamed. Two men with lassos ready waited on either side, their mounts aquiver. Ace's ruddy face had grown strangely lined, but he stood his ground.

"The fellow that rides that bull is sure foolhardy," the Senator was remarking, pulling his hat further over his iron-gray brows against the slant of the sun. Then the Ranger rode up with Rosa, and she was invited to a seat behind the fluttering flag.

"Either that or almighty sandy," amended Radcliffe.

Like a streak of lightning the bull arose, jaws slavering. One mighty crack and he had burst the gate, a plunge and he was plowing his way across the field, trailing a rope that still held his saddle horn. The starter raced after, his

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big bay holding back with all his might on the rope. The dust blew chokingly into the faces of those on the Senator's side of the corral.—Then the bull caught sight of that fluttering red, white and blue.

For one awful instant Rosa found those staring white-rimmed eyes glaring straight into her own. The bull's next leap would carry him over the fence and into the machine. She blanched, but sat silent. Pedro, drawn up beside her on his pinto, felt paralyzed. The Senator threw his engine on as if to back away.

"Hold him!—HOLD him!" shrilled the starter, pounding back. The rope on the saddle horn—would it hold? Then a lasso was thrown, tightening neatly around the hind legs of the runaway.

"Got him stretched now!" came the triumphant shout, as the bull went down with an infuriated snort, and lay there, chest heaving, while the vaqueros made him fast.

"The ride's off,—nobody goin' to ride *him* to-day!" decided the man on the bay. The bull was relieved of his saddle and headed protestingly back into the small corral.

Ace King's face was set in deep lines. He

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had been all nerved up to his ride. Now that it was off, his knees felt shaky, and he climbed to a seat on the top rail.—And Pedro flushed to hide his pallor.

But Ted's time was yet to come. One rider in between, whose horse piled him on the ground, and the announcement came: "Ted Smith from Peach Cove, rides Spitfire from Huntington Lake."

"I'm sorry for that kid," stated Long Lester, who leaned lankily over the gate, thumbs in the arm-holes of his vest. "Want up, little miss?" and he helped a child to a vantage point beside him.

"Go to it, old pal!" Ace thumped the contestant breath-takingly.

"Spitfire! O-o-wah-hoo-o!" bellowed a group of cow-boys, in imitation of the falsetto Indian yell.

"OO-wah-hoo-oo-oo!" the Indians bettered them.

Senator King honked in joyous abandon. Pedro's dark eyes flashed. "Spunky kid!" commented Radcliffe. "I'm betting he'll ride him straight up!"

"He'll be killed!" Rosa shivered.

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"Not with those long legs to get a grip with," the Ranger reassured her.

"Ain't that hoss a dinger?" admiringly Long Lester demanded of the assemblage, as Spitfire danced forth with three lassos trying to hold him for the blinders. Again he tried to climb the fence, eyes wide, nostrils quivering.

"I'm just itchin' to ride him," Ted replied to Ace's questioning gaze. Every nerve in his wiry body was keyed electrically. Then the saddle was adjusted, Ted was in the stirrups, and the blinder was jerked free. "R-r-ready! Let 'er go!" was megaphoned.

About that time things began to happen. Spitfire, as if feeling that his reputation needed demonstrating, began to double in his best bucking form.

"*Ride* him, Ted!" yelled Ace. "Hey, Ted rides him, eh?"

"Scratch him!" contributed Long Lester, who believed in spurs. "Say, he's a-scratchin' him up and down!—Ya-hooooooo!" as Ted rode him up again and again, both arms free, slapping him hip and shoulder, hip and shoulder with his sombrero. Zip!—*Zip!*—Zoom!—Around and around they went, the mustang

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snorting loudly with each bounce, lathering in his effort to unseat his rider. But Ted had grown to his back.

The broncho stopped, exhausted, flanks heaving.

"SOME riding!" gasped Pedro.

Then a shout went up. Ted was champion rider of the rodeo!

To the ranch boy's amazement, he now found his long legs dangling from a seat on the shoulders of his two college friends, while they marched about to the tune of "A Jolly Good Fellow,"—Norris himself laughingly joining in the chorus, and Long Lester thumping him breath-takingly between the shoulder blades.

That was the day the camping trip had been planned. It was also the day Ace's little Spanish 'plane, wirelessed from its hanger in Burlingame,* had given them all a surprise, and a trial sail. The pilot arrived shivering in leather jacket and heavy cap, woolen muffler and goggles, with similar wraps for Ace, whose leather chaps now served a purpose. For the intense cold of the upper levels it was neces-

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* Pronounced Blingam.

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sary for the pilot to lend his outer apparel, as each of the prospective camp mates in turn took the observer's seat, with Ace piloting.

Ted was used to flying with him,—had, indeed, given him the nick-name which all had now adopted, as a compliment to his exploits as a birdman. But to the other three it was a new experience. He invited Norris first. Their route lay like a map below them, as they winged their way across the sky, steering first due South till the rim of King's River Canyon threatened to suck them down into its depths, then circling to the East till they could see Mt. Whitney rising snow-capped above the surrounding peaks, and back to the waiting boys.

Long Lester ventured next, and as he afterwards expressed it, he thought he was riding on the back of his neck as they soared into the blue deeps above them, while the ocean of the atmosphere tossed them about capriciously. This time Ace, running her into the cold strait above the river, headed her down canyon to within a hundred feet of the forest top, his grit based on sound mechanical training; his daring counterbalanced by his cool headed precision. He tried no stunts, however, as he had prom-

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ised his father to indulge in no aerial acrobatics under 1,000 feet. When they finally returned to terra firma, right side up with care, the old prospector expressed himself as nowise envious of Elijah.

Pedro belted himself in with a lack of enthusiasm that Long Lester did not fail to note with sympathy, and away they soared, fearlessly on Ace's part, whose eyes, ears and lungs were in the pink of condition. But to the Spanish boy came first a dizzy, seasick feeling, coupled with a conviction that he could not draw breath against the head wind, then a chill that penetrated even the pilot's uniform, as he watched the earth recede beneath them. The motor purred as they gained momentum and the propellers whirred noisily, and the changing air pressures so affected the stability of the light craft that he felt half the time as if they were lying over on their side. He also reflected that, should the engine stall, their descent would be a matter of seconds only. In the dry heat they had been traveling with what seemed terrific speed. He protested once, but Ace did not hear him.

Then in the cold of the higher altitude, their

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speed was reduced and traveling was smoother. When at last the great white bird dropped back almost on the spot from which they had started, —the distinguishing feat of the Spanish 'plane, —he was almost a convert, though as Lester said, "a little green about the gills." When later the opportunity came to try it again, he abdicated in favor of Ted.

Norris assured them that there is air for 50 miles above the earth, and sometimes a tidal wave of atmosphere reaching as high as 200 miles, though after it gets about 190 degrees below zero, less is known about it. Its density is reduced fully half at 18,000 feet,—half a mile above the highest peaks, like Mt. Whitney, but though the air of high altitudes is more buoyant, the cold none the less reduces the speed of the air cruiser.

While they were eating they discussed their itinerary.

Norris had the large trail maps of both Sierra and Sequoia National Forests. These he laid out and pieced together into one big sheet ten feet long. On these maps were marked out the good camp grounds, and where bears, or deer, quail or grouse, might be found,

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where supplies were obtainable, or pack and saddle stock, guides and packers, or Forest ranger stations (little cabins flying a flag from their peaks, to make them show up on the map).

There were the "roads passable for wagons," "trails passable for pack stock," and "routes passable for foot travel only." There were areas marked with varying tiny green tufts of grass labeled "meadows where stock grazing is permitted," and "meadows where it is not permitted," "meadows fenced for the free use of the traveling public" and "meadows fenced for the use of Forest Rangers only."

Diminutive green pine trees indicated forest areas particularly interesting, striped red areas signalized National Forest timber sales, cut over or in operation, black triangles denoted Forest Service fire outlook stations, and a drawing that looked like a woodshed showed where Forest Service fire fighting tools had been cachèd in various out-of-the-way places. "TLP" indicated the free Government telephone boxes, red doughnutty-looking circles meant good mountains to climb, with some indication of the safest routes to the top, areas marked out in red diamonds were labeled as

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geographically interesting, and those in green as botanically of more than ordinary interest.

A green feathery-looking line meant a canyon, a green triangle a waterfall, a plain green line a stream offering good fishing, and a broken green line a stream stocked with young fish, while an X meant a barrier impassable by fish, though what that meant, not one of them could say.

There were various other marks, such as a hub surrounded by the spokes of a wheel (whatever it was intended for), the key to which explained that from that point a good view was to be obtained.

But what most attracted their attention, all up and down the crest of the Sierra Nevada as it stretched from North, North-West to South, South-East, were the wide green areas "of special scenic interest," most of which was marked "UNEXPLORED!" in great warning red letters.

It was this part of the map that most fascinated the little camping party. Why should they choose a route that was all cut and dried for them, as it were,—where each day they would know when they started out just about

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where night would find them and what they would meet with on the way? Who wanted their views labeled anyway? That was all very well, very thoughtful of the Forest Service, for inexperienced campers, who would probably never venture into the unknown. But to Ace, the airman, to Ted, with his experienced wild-craft, and to Pedro the romanticist, no less than to the young Yale man whose thirst for far places had led him into the U. S. Geological Survey, the Mystery of the Unexplored called, with a lure that was not to be denied. Long Lester, they knew, was game for anything,—for had he not prospected through these mountains all his life? There was practically no place the sure-footed burros could not go, and there was no danger they were not secretly and wickedly tingling to encounter.

It was a wild region, as rough and as little known as anything from Hawaii to Alaska,—only different. The John Muir Trail, named for the explorer,—a "way through" rather than a trail,—stretched along the crest of the range, the roughest kind of going, (absolutely a horseback trip, it was generally pronounced,) and from its glacier-capped peaks, from 14,500 foot

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Mt. Whitney, to the even more difficult though less lofty Lyell, ran the Kings' River, North, Middle, and canyoned South Forks, the Kern and the Kaweah, the Merced and the San Joaquin,—to name only the largest.

Unlike the older Eastern ranges, the Sierra is laid out with remarkable regularity, the one great 12,000- to 14,000-foot divide, with its scarcely lower passes, giving off ridges on the Western slope like the teeth of a coarse granite comb. Between ridges, deep, glacier-cut canyons, "yo-semities," (to employ the Indian name,) with their swift, cascading rivers make North to South travel difficult, though one can follow one side of the openly forested canyons to the very crest of the main ridge.

Here and there was a grove of Big Trees, varying in size from the Giant Forest of Sequoia National Park to the few mediocre specimens at Dinkey Creek. But as a rule the hot, irrigated valleys of the Sacramento and San Joaquin gave way to patches of the small oaks and pines of the foothills, and these in turn, several thousand feet higher up the Western slopes, to yellow pine and incense cedar, Sequoias and giant sugar pines. Higher still

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came the silver fir belt, and after that, the twisted Tamaracks and dwarfed and storm-tossed mountain pines, reaching often in at least a decorative fringe along the rock cracks to the very peaks, all the way up to 12,000 feet. (Tree line in the White Mountains of New Hampshire comes soon after 5,000.) Above that, of course, only snow and ice could clothe the slopes.

Hell-for-Sure Pass was one name that attracted Ace's eye on the map. He judged that it must mean stiff going,—but even had they actually planned to climb that way, he would have preferred to wait and discover for himself the reason for its nomenclature. There was also Deadman Pass, (another name to tickle the imagination,) Electra Peak, Thousand Island Lake, The Devil's Post Pile, Volcanic Ridge, Crater Creek, Stairway Creek, Fawn Meadow,—and dangerously near, Bear Meadow,—Vermilion Cliffs, Piute Pass, Disappearing Creek, Lost Canyon, Table Mountain, (reminiscent of the Bret Harte days,) Deadman Canyon, (flavoring more strongly of the gold days of '49,) and Rattlesnake Creek, (doubtless deserving the title.)—To say noth-

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ing of such ordinary features as 13,500 foot University Peak, (a mere wave of the sea of peaks surrounding champions Lyell and Whitney,) Diamond Peak, 13,000 feet, Mt. Baxter, likewise around 13,000, Mt. Pinchot, and a score of others, (occurring at short intervals in a solid phalanx.) Whoever wants to climb a mountain everybody climbs, seemed to be the final verdict of the party. There are other peaks almost as high as Whitney, (certainly quite high enough to suit the most fastidious sportsman,) and probably even more difficult of ascent. Why not discover something new under the sun? In other words, why not strike off at random into the Unexplored? They would head right into the thick of the thickest green patch on the map, and wander as fancy dictated. If they felt like climbing, they would climb. If they felt like lazing, (as Pedro put it,) they would laze. If they came to a river they could cross, all right. If they could not cross, why, all right, who cared?

There was rumor of vast caves that riddled the back country. There were hot springs, soda springs,—who knew what? Good pasturage was never hard to find. The verdant mea-

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dows left by the glacier lakes could be counted on up to the very backs of the 9,000 foot ridges. Most of them were half to a mile wide, and at the head waters of the big rivers, they had heard, were meadows nearer ten miles in length.

With one exception, every lake in the Sierras is a glacier lake, (that exception being Huntington, a "made" lake four miles long that falls three thousand feet through a flume to add power to an electric plant.) These lakes lie all the way up to as high as 8,000 feet above sea-level, Norris's theory being that in time they will be found higher still. The glaciers left by the last ice age naturally melted first in the lower reaches, and as those that now cap the peaks and flow down between ridges like the arms of a starfish, melt in their turn, they will leave their icy, green-blue crystal pools higher and higher up the mountainsides. Just North of Mt. Ritter, Norris told them, lies a glacier lake at an altitude of 12,000 feet, while the glaciers still to be found are slowly, slowly grinding out the basins of the lakes that will one day, (possibly centuries hence,) lie where now linger these evidences of the last glacier epoch.

Where these lakes have in their turn disap-

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peared they have left these rich-soiled meadows. Where these level-lying meadows failed them pasturage for their burros, Norris guaranteed that there would be plenty of hanging meadows,—long, narrow, bowldery strips of weed enameled verdure slanting up and down the moraine-covered canyon sides, beginning away up at timber line, where springs the source of their life-giving moisture.

Before the group broke up that day, word came that Rosa's brother had broken his leg, there at the fire outlook on Red Top. (A pack-mule had crowded his horse off the trail on the steep slope of an arroyo, and the horse had fallen, though breaking his otherwise sure descent into the creek below by coming sharply up against a tree trunk.)

"The worst of it is," worried Radcliffe, "with men so scarce, I don't know who to send in his place. Besides, it's a week's horseback trip from here,—and fires breaking every day, —and he needs a doctor."

It was not till the deed was done that Ace returned to announce, with the smile of the cat who has licked the cream, that Rosa had insisted on taking her brother's place. He, Ace,

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had found the spot from her sure knowledge of the topography of the place. (She had kept house there for her brother the summer before, in the wee, wind-swept cabin.) And leaving Rosa there, as she pluckily insisted, Ace brought her brother back, covering in minutes, as the bird flies, what it would have taken a week to traverse on horseback. Those mountain trails corkscrew up and down the canyon sides till instead of calling a certain distance a hundred miles according to the map, one states it, "a week into the back-country,"—or in the case of the trailless peaks, (among which Long Lester felt most at home,) the same distance might be a matter of a four-weeks' camping trip, with no human habitation, and the likelihood of not even a ranch at which to purchase supplies, in between.

Then the Senator sent the 'plane back to San Francisco, and its hangar in Burlingame, before —as he said—his young hopeful could start anything more. He himself was to spend the next month fishing around Kings' River Canyon, putting up at the canvas hotel. But he took as much interest in the camping trip as if he had been a member of it,—as, indeed, did

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Ranger Radcliffe, though word of a fresh forest fire breaking cut short his part in the powwow.

The question now arose, should they go horseback, or afoot with pack-burros,—a string of which Long Lester yearned to pilot.

True, a mountain-bred pony will hop and slide up and down mountain ledges that would make an Eastern horses' hair literally stand on end. They have been born and bred to it, physically and mentally. They have been known to sit back almost on their haunches and slide when they could get down no other way. Some of them will walk a log twenty feet above the surface of a stream. (The Eastern rider will find that hard to believe, until he recalls the feats of circus horses.) But not all horses are alike, any more than people. Why should the plains horse and the park horse and good old Dobbin, the farm horse, be equine mountaineers and prospectors?

"Shank's horses" and the pack-burros won the final ballot,—to Pedro's open dismay. But they would first ride the well-defined two-days' horseback trail from Giant Forest to the Kings' River Canyon, and Giant Forest is an

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automobile stage ride from Fresno, which is another short day's ride from Huntington Lake.

(Strange are the threads of destiny! Not one of that group so much as dreamed that they were embarking on anything but a five weeks' camping trip.)

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CHAPTER II

THE CAMPING TRIP

A WEEK later Norris and the boys arrived at the lumber camp on the Canyon rim, where they were to await Long Lester, —Ace in a piratical and plutocratic black Stetson sombrero, hiking boots and flannel shirt, a red bandanna at his throat, and to supplement his khaki riding breeches he had bestowed lovingly in his duffle bag the Mexican leather chaps. He also displayed the eight-inch leather belt of the cow country, and elbow length leather cuffs studded with silver nails.

Ted let it go at his second best blue overalls and heavy shoes, a green plaid gingham shirt, with a brown one to change off and straw hat. Pedro lounged gracefully about in corduroy trousers and elkskin boots, (which Norris warned him would last about a week on such rough going,) and a wool jersey in the same

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soft tan. He took their guying good naturedly, however, and in mockery of Ace's more picturesque accouterment, gave a first class imitation of a motion picture director with the Senator's son for his prize Bad Man. Norris wore his second best uniform, and all had sweaters and a change of socks and things, to say nothing of an extra pair of shoes.

When word came that the old guide had had "some investment business" come up to delay him, they decided to establish a make-shift camp. There was not one chance in a hundred of any rain, but they decided a lean-to would be convenient anyway. They got some shakes of an old lumberman whose function it was to split the giant shingles from three foot lengths of log.

Four poles for corner-posts made a substantial beginning. Smaller ones morticed to lie crosswise gave something to which to nail the shakes, which were overlapped shingle-fashion on both sides and roof. The tarpaulins would make a curtain across the front. The floor was bedded down a foot deep with springy silver fir boughs, laid butts down and toward the foot.

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To this could be added fresh browse as it grew dry and harsh.

Tables were made by borrowing a saw of the lumbermen and slicing a four foot log into eight inch slices, then gouging these out on the under side so that stout legs could be fitted in. Stools were made from short lengths of a smaller log, and behold! the open air dining-room and kitchen were furnished, at cost of a few hours' fun.

Norris even made a sort of steamer chair of poles, using a double thickness of his tarp for the seat and back.

Next came a stone fireplace, with an old piece of sheet iron across the top, and a great flat hearth-stone on which to warm the plates.

Each tin can as it was opened had its top neatly removed and was washed and set aside as a chipmunk-proof container, and Pedro fashioned a refrigerator by replacing the two sides of a cracker box with screen wire, (bartered from the cook of the lumber camp,) hinging the door with discarded shoe tongues.

Cord was strung for clothes-line, and a supply of several kinds of fuel brought in. The down

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logs were simply run into the fireplace, butt ends first, and shoved closer as they burned. Ted devised a rake for gathering together the dry twigs and cones and bark with which the ground was strewn, by using nails for teeth, set in a small board fastened at an angle to the stick that served as handle.

Following Norris's lead, each fellow heated water and took a sponge bath daily, (except Ace, who took a cold plunge in the glacier-cold stream,) and afterwards washed out his change of socks and underwear and his towel. The dish-washers also laundered the dish towels after each meal. That way, everything was always ship-shape. And, be it noted, any cook who burned the nested aluminum pans and kettles had to clean them himself, and though Norris had made that easier by bringing along a box of fine steel-wool, it was amazing how few scorched dishes occurred! Of course where pots were used over the fire, the outsides got sooty, but after all, it was only the insides that affected one's health.

The boys found that they slept warmer by doubling their blankets into sleeping bags, pinning them shut with horse-blanket safety-pins,

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with their tarps for a windproof outer layer. And many's the sleeping bag race they ran,—or rather, hopped, to the amazement, no doubt, of the wild folk who very likely watched from the shadows. Agile Ted won the grand prize at one of these stunts by hopping the full length of a fallen log in his bag, without once falling off.

There were also pine-cone battles and bait-casting contests, Pedro excelling in the throw by reason of his big arm muscles. Thus day succeeded cool and perfect day, and night followed star-strewn night, for nearly a week. The tooth-brush brigade sallied forth as soon as the sun began slanting its long morning rays through the forest aisles, and the boys often began nodding at a ridiculously early hour around the bon-fire, tired from their strenuous day in the open. But each day found their spirits higher, their muscles harder, their eyes brighter,—and their appetites more insatiable. Ted was plumping up and Pedro trimming down on the self-same medicine.

The chipmunks soon became so tame that they ran all over the place, over the boys' feet, on up to their shoulders, and into their pockets

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for the goodies they sometimes found.—But they never ran under any one's palm. Pedro got one cornered and caught him with his bare hands, and put him on a leash, but the furry mite spent the next half hour straining to get away, too unhappy to eat,—cowering, trembling, when the boys stroked his orange striped back with a gentle finger,—and Pedro finally gave him back his freedom, (and a pyramid of peanuts.)

"Camp Chipmunk" it was finally voted to call the place, and the name was inscribed on the side of a huge fallen log with bits of yellow-green live moss.

Though the chipmunks could easily have gone to the creek, as they must have before the boys came, they displayed a preference for drinking out of the same water pail the boys did, and they sometimes took an unexpected and unappreciated plunge bath.

Besides the very tiny chipmunks, there were some of the ground-squirrel size with the same orange and black. They were duller of wit, and more timid, but they used to chase the little fellows to within an inch of their lives. One day a big Sayes chipmunk attempted to fish a cheese

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rind out of the fireplace. The ashes were still hot, and he plunged into the soft stuff over his head, he was out and away, with a piercing squeal, almost instantly, trailing white ash behind him.

The boys used to bury nuts just to see how fast the littlest chipmunks would smell them out. After repeatedly finding the Dutch oven bread nibbled around the edges, Pedro hung the bread-bag from the clothes-line one night. He was awakened next morning by the shout Ted sent up when he found two chipmunks running down the string and squeezing their way delightedly into the bag.

Some one always had to watch while the meal was being laid, for the mouselike villains would be right up on the table sampling the butter, if some one did not keep an eye out. Or they would climb up the leg of the table and peek over the edge with their beady eyes, wondering how far they dared approach without danger to their agile persons. But the funniest thing was when two chipmunks would quarrel,—as generally happened when one unearthed a nut that another had buried. Nickering in the angriest way imaginable, the two tiny things would

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come at each other with ears laid back, in what appeared for all the world like a head-butting contest. Around and around they would whirl in a spiral nebula, till one got a head start on a race for home and mother.

Each morning they awoke to the hack-hack-hack of the sawyers and the steady grating of the log saw, the twitter of the donkey engine and the volcanic remarks with which the bull-puncher was urging his team forward. The yellow sunshine sifted aslant through the giant trees, birds sang, and chipmunks chattered. A water-packer passed them one day with his mule plodding along under 40 gallons disposed in canvas bags on a wooden frame, and beyond, across the singing creek, they could see the swampers burning the brush they had cut from the pathway of the tree next to fall.

Breakfast dispatched, the boys hurried over to watch the two-bitted axe biting its huge kerf in the side of a ten-foot trunk. When it had eaten a third of the way through the giant trunk, the sawyers began on the opposite side, nearly as high as the top of the kerf, resting the long instrument on pegs driven into two holes that had been bored for the purpose.

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Iron wedges were driven after the saw. The instant the tree began to lean, the head chopper had driven a stake about 150 feet from the base on the side of the kerf, declaring that the falling tree would drive that stake into the ground, so accurately could they gauge the direction of its fall. The swampers had cleared the way between. Then came the cracking of neighboring branches, as the mammoth trunk swayed and toppled to the forest floor. There was a crash that shook the ground, which rebounded with a shower of chips and bark dust, and the stump gaped raw and red where for perhaps 2,000 years it had upborne the plumed Sequoia Gigantea.

The boys, far above whose heads the fallen trunk towered, scrambled up the rough bark and raced each other up and down the novel roadway that it made. Then, the excitement over, they suddenly realized that they were hungry and ran another race back to camp.

Later they watched as the donkey engine, stronger than ten oxen, was made fast to a stump and stoked till it could move itself into position to haul the log lengths to the waiting ox team. Peelers with axes and long steel bars

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had been peeling off the thick red bark, which the boys found could be whittled into odd shapes and rubbed velvety at the cut ends. The sawyers were sawing the trunk into lengths short enough to ride on box cars, and the chain tenders were driving the "dogs" or steel hooks into the forward segment preparatory to attaching the chain that was to draw the log after the panting donkey engine. The block shifter was ready with his pulley, and the gypsy tender was gathering down wood.

Suddenly, just as the chain had stretched till the log began to move, some weak link snapped and with a rebound like that of a cannon it flashed over the hillside, catching one man and toppling him over with a broken leg. The camp cook, whose accomplishments varied from the ability to deliver an impromptu and usually unsolicited sermon to that of calling off the numbers at a stag dance, was summoned in haste and from a long black bag that went with the framed diploma that hung at the head of his bunk, this unusual individual administered surgical treatment. The injured man took it philosophically,—his out of door constitution would repair the damage with more than average

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speed,—and the work of getting out the big log proceeded as before.

They also watched, fascinated, as the logs at a camp further back were sent down a crude slide that slanted sheer to a sizeable lake. Ace threatened to try riding a log some time, but Norris rendered one of his rare ultimatums on that score.

"Let's take plenty to eat!" bargained Pedro, who was beginning to suspect it was no afternoon stroll he had embarked upon. "Hadn't we better 'phone old Lester to lay in some extra supplies?"

"There is always fish," Norris reminded him.

"One gets tired of fish. I say let's take plenty of grub, if we're going away off where for weeks we may not see a living soul to buy a pound of bacon of. Eating's half the fun of camping. And if we get up there on the John Muir Trail, we can't even catch fish, can we—always?"

"That's the stuff!" seconded Ace. "If we aren't tied too tightly to the problem of rustling grub, we will be freer to roam where we please. But gosh! Won't it take a whole

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train-load of burros to pack enough stuff? Five men, three times a day, that's fifteen meals. And thirty days would make it 450 meals. Besides we'll eat just about double the normal number of calories,—the way I feel already. And twice 450 meals is 900."

"Whoa, there!" begged Norris. "How much can a burro carry, anyway? We can't take all our food, or we'll have such a pack-train we won't have time for anything but donkey driving, and if we carry feed to keep them going on the trail, we'll have to take more burros to pack the feed, and they will have to have feed too, and—there's no end to it."

"Well, of course we'll fish, when we can," amended Pedro. "And we can take compact rations, dried stuff, instead of watery canned goods. They're just as good, aren't they? Only the water's been taken out of them, and we can put it back in each night before we eat it. What's the use of packing tin cans that are mostly full of water?"

"I wouldn't call canned peaches mostly water," retorted Ace, who though less dependent than the plumper Pedro on his three square

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meals per day, was even more particular what those three meals tasted like.

"It isn't only the juice," said Pedro. "The peaches themselves are half water. Dried peaches are the same thing except for that, and two pounds of dried peaches will go a whole heap farther than a two-pound can, let me tell you!"

"All right," said Ace. "Dried peaches! What else? Mr. Norris, you've had a lot of experience on these back-country trips."

"H'm!" said the young Survey man, his eyes lighting reminiscently. "Did you ever eat black bean soup with salt pork and garlic to flavor it?"

"I have," said Pedro. "It's a meal in itself, with black rye bread and dill pickle. And what about fried frogs' legs and watercress? Broiled mushrooms, stewed mushrooms and onions, and crayfish soup?"

"Sounds good to me," Ace admitted. "But have we a mushroom expert in our midst? I'm not ready to commit suicide just yet."

"Nor I," laughed Norris.

"Nobody asked you to," Pedro looked ag-

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grieved. "Goodness knows I'm no expert, but I do know a few kinds, and I know those few kinds for sure."

"Hot dog!" commented the Senator's son. "Go to it, ol' boy!"

"Then," Norris continued, "there've been times in my life when I didn't turn up my nose at corned beef hash browned."

"And spuds!" Ace completed the recipe. "And onions."

"Dehydrated," Norris admitted. "Can't carry potatoes for more than the first few days, and dried onion is just as flavorful as fresh."

"An onion a day—" began Ace.

"Keeps everybody away," finished the young Survey man laughingly. "And that reminds me of apples,—dried apple pie, apple pudding, apple dumplings, (baked or boiled,) apple fritter, (made with pancake flour,) and apple pandowdy with cinnamon."

"Pan-dowdy?" queried both boys.

"Yes, when the cook has to roll it out with a bottle, or an oar handle, or a smooth stone instead of a rolling pin, and perhaps bake it in the frying pan, and he hesitates to label the result, he terms it pan-dowdy, and then nobody

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has any kick coming if it isn't exactly flesh, fish or fowl, if you get me."

"We get you!" grinned Ted, who had thus far been a silent partner to the plans. But as usually happened at such times, he had been doing a lot of thinking. He now added his contribution: "How about rainbow trout broiled with pork scraps, and served with horseradish? Let's take a bottle of horseradish."

"Dried horseradish and a grater," amended Pedro.

"All right. Then there's trout baked with tomato and onion sauce, trout baked in clay, trout boiled for a change, with lemon, (we could start the trip with a few,) trout skewered, griddled, baked in ashes, baked on a stone, fried—of course, and roasted and stuffed with sage.—Let's take sage. Then how about cold boiled trout salad with mustard dressing, and fish chowder a la canned milk, with dry-dated—what do you call it? De-hydrated potatoes and evaporated onions? Eh? And garlic isn't such a bad idea. It's the handiest little bit of flavoring I know of,—if we all go in for it alike."

"We'll all go in for it good and strong," winked Ace.

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"Strong is the word," chuckled Norris.

"Anyway," Ted defended his suggestion. "I've camped through the back-country a heap in my time, and I've generally found it isn't the sameness of the fish-three-times-a-day that lays you out, but the lack of flavorings. Now I even take caraway seed to give a different flavor to a batch of biscuit, and raisins, or some anise seed, or a little strong cheese, that you can grate into it or on it and then toast it till it melts. Then there's cinnamon and cheese toast for dessert, and plain cinnamon and sugar melted on white bread makes it just bully! And why do we have to eat white bread all the time anyway?"

"Of course we'll have cornmeal and buckwheat in our pancake mixture," said Norris.

"Bully! But why not take part rye flour too, and part oatmeal to mix in? It bakes fine and flaky. And there's oatmeal cookies mixed with peanut butter and sweetened!"

"Good!" Norris pronounced.

'Y'r *all right,* kid!" Ace thumped affectionately on his thin shoulder blade, "y'r all right," but at the threatened repetition of the bearlike caress, Ted dodged.

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"Another idea," Pedro broke in. "Why eat bread all the time anyway? Why not macaroni and cheese, and spaghetti and tomato paste?"

"And garlic?" teased Ace.

"Surest thing you know! And vermicelli, and noodles, and all those things. They're all made of flour, and they're different."

"A little bulky," protested Norris.

"Oh, well, for the start of the trip, then. They're not so heavy, parked up on top of a burro's regular pack."

"Good!" agreed the leader of the expedition. "We may come to cattle ranches where we can get beef and mutton occasionally, though not after we get into the higher altitudes. And we can start off with a few fresh eggs, for compactness and safety broken a dozen at a time into glass jars. After that—I don't know whether you fellows would like scrambled eggs or not, made of egg powder. Personally I don't. Nor the famous erbswurst."

"Aw!" drawled Ted, barely concealing his impatience. "The thing that stands by you best on a hard trip, after all, is jerky and pemmican. I think old Lester jerked some venison himself last fall, and he's probably got it yet. And he'll

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grind us some pemmican, if we get him word before he starts."

"Gee Whiz! Those are emergency rations!" vetoed Ace.

"We'll have to have a long distance conversation with him to-night," said Norris. "Meantime we mustn't forget pilot biscuit and peanut butter for a pocket lunch and shelled peanuts, of course, and rice, and tea and coffee, and sugar, and baking powder."

"There are two things that can compactly," conceded the Castilian boy at this point. "The best grade of canned beets and spinach are pretty solid weight. I'll make no kick if we load on some of that until we get to the steeper grades."

"Hey!" shouted Ace. "In all this time nobody's mentioned bacon."

"We took that for granted," laughed Norris. "I'll bet Long Lester would never start out without it, whether we told him to or not. But I'm awfully afraid we'll use more tea than coffee. It's bulky, and worse, it loses flavor."

"Oh," said Ted, "I know the answer to that. Powdered coffee isn't one quarter so bulky, and

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put up in little separate tins, we keep opening them fresh, don't you see?"

"I've never yet seen a powdered coffee that could compare with the real thing," Ace complained.

"Why couldn't Les buy the real thing and then get it powdered and sealed into little separate tins for us?"

"He could," agreed Norris, "I suppose,—if we're going to be as fussy as all that." (Ace flushed.) "But with our woods' appetites——"

"Oh, and citric acid tablets," the Senator's son hastened to change the subject. "For lemonade, you know."

The discussion was cut short by Pedro's discovery that a bear had invaded the lean-to.

The American black bear, and his California cousin whose coat has generally lightened to the cinnamon brown of the soil, is all but tame in the National Parks, where for years he has been unmolested. A friendly fellow even in the wild state,—for the most part,—he roams the Giant Forest as much a prized part of the landscape as the Big Trees themselves. He has learned to visit the garbage dump regularly

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every night, and it causes no sensation whatever to meet one on the trail. It was much the same about the lumber camp.

But to have him visit uninvited, and serve his own refreshments from their selected stores, was a less attractive trick. Nor did he show the slightest inclination to take alarm and vacate when the boys returned. On the contrary, he snarled and showed his teeth when they would have driven him from the maple sugar can, and even Ace felt at the moment that discretion was in order. It was not till Old Shaggy-Sides had pretty well demolished everything in sight, and then carried the ham off under his arm, that he took a reluctant departure.

This would never do. That night the unprotected edibles were hoisted just too high for a possible visitor to reach, on a rope slung over the limb of a tree. The boys still slept under the stars, for they knew enough about bears, (all but Pedro,) not to be afraid. Pedro, however, got little sleep that night, though he would not have confessed to the fact for anything on earth.

"There was one bear in Sequoia Park," re-

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membered Ace, "who got too fresh, that way, and raided some one's tent, and they had to send for help to get him out. When it happened half a dozen times, he was ordered shot. But he was the only one I've ever heard of acting that way. Now I'll bet, if we'd inquire, we'd find this bear had been half tamed, and altogether spoiled by these lumbermen.

"We were driving through Yellowstone last summer when one of those half tame bears came out to beg. We stopped the machine and I fed him some candy. Then we parked, and went up to the hotel for dinner. When we came back, we found he had mighty near clawed the back seat to pieces,—and why do you suppose? —To get at a side of bacon we had stowed away in there."

"Did he find it?"

"We never did."

"That reminds me of something I heard," laughed Norris. "Some friends of mine in Sequoia left their lunch boxes in the machine while they went to climb Moro Rock. When they came back they found a cub calmly sitting up there behind the wheel, eating one lunch after another."

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Pedro was in for moving their headquarters to a great hollow Big Tree, the cavity in which was as large as a good sized room, with a Gothic sort of opening they could have made a door for. But the very next morning the old prospector arrived with the train of pack-burros, and they were off.

"How do you explain the Sequoias, Mr. Norris? Will we find more of them?" asked Pedro, with a last wistful backward glance.

"The Big Trees are by no means confined to Sequoia National Park and other well known groves," said the Survey man. "The Sequoia gigantea is to be found in scattered groves for a distance of 250 miles or more, up and down the West slope of the Sierras, at altitudes just lower than that of the belt of silver firs,—that is, anywhere from 5,000 to 8,000 feet above sea level. And in fact, south of Kings' River, the Sequoias stretch in an almost unbroken forest for seventy miles. Nor are they all of the proportions so often cited, where a man standing at their base looks like a fly on the wall by comparison with these prehistoric giants. Nor did they all get their start in life 4,000 years ago. There are young trees in plenty, saplings and

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seedlings, who will doubtless reach the patriarchal stage some 4,000 years hence. On what kind of earth will they look then? On what stage in the evolution of civilization? Will another ice age have re-carved these mountains? And how will man have learned to protect himself from the added severity of those winters?"

"It certainly gives one something to think about," mused Pedro. "It is only in these younger specimens that you can see what a graceful tree it is!" He glanced from a feathery Big Tree youngster of perhaps 500 summers, with its slender branches drooping in blue-green plumes toward the base, with purple-barked limbs out-thrust on the horizontal half way up, and at the top reaching ardently heavenward. Near it stood a parent tree of perhaps middle age, born around the time of Christ, whose crown was still firmly rounded with the densely massed foliage, now yellow-brown, and the bark red-brown.

The millions of two inch cones, surprisingly tiny for such a tree, hang heavy with seeds,—they counted 300 in a single green cone.

"With such millions of seeds," puzzled Pedro, "I should think the trees would grow so

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thick that there would be no walking between them."

"No," said Norris. "In the first place, remember that not one seed in a million escapes these busy Douglas squirrels and the big woodcocks that you hear drumming everywhere. Then even the millionth seed has to risk forest fires and snow-slides, lumbermen and lightning. But I'll tell you something funny about them. You'd naturally think, from the number of streams in these forests, that they required a lot of moisture. Well, they don't. Further South they grow and flourish on perfectly dry ground. But their roots retain so much rain and snow water that their tendency is to *make* streams. The dense crown helps too, by preventing evaporation. You'll find Sequoias flourishing in a mere rift in a granite precipice. But wherever you find a dense growth, as you do here, there you will find their roots giving out the seepage that feeds a million streamlets, and these in turn feed the great rivers.

"You see these trees *must* be able to survive drouth or they could not have survived the changes of so many thousand years. Why, these Sequoias might have formed one continu-

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ous forest from the American River on South, if it had not been for the glaciers that swept down the great basins of the San Joaquin and Kings' River, the Tuolumne and the Stanislaus."

"But why didn't the glaciers clean them off the basins of the Kaweah and the Tule Rivers, too?"

"Ah! There the giant rock spurs of the canyons of the King and the Kern protected the Tule and the Kaweah, by shunting the ice off to right and left."

"There's one thing more I'd like to know," said Pedro. "Where will we find the nut pines that have the pine nuts? Aren't they delicious?"

"There are several kinds," said Norris. "There is a queer little one with cones growing like burrs on the trunk as well as on the limbs, but that is only found on burnt ground. Another, that forms a dietary staple with the Indians of Nevada, is to be found only on the East slope of the Sierra, and the little nut pine that our California Indians harvest is away down in the foot-hills among the white oaks and manzanitas, so I'm afraid whatever else we come

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across on this trip, we won't want to count on pine nuts."

"What interests *me* more," said Ted, "is whether we are going to come across any gold or not."

"Now you're talking!" the old prospector suddenly spoke up.

Ted's eyes shone.

Ace had an experience about this time that flavored his nightmares for some time to come. Following a lumber chute, one of these three board affairs, up the side of a particularly steep slope one day, where at the time of the spring floods the yellow pine logs had been sent down to the river, he thought to try a little target shooting with Long Lester's rifle. But at the first shot a bunch of range cattle,—of whose presence he had not known,—began crowding curiously near. He fired again, and a cow with a calf took alarm and started to charge him, but was driven back with a few clods and a flourished stick.

He fired again. This time, quite by accident, his bullet hit an old bull squarely on the horn. The shock at first stunned the animal, and he fell forward on his knees. Recovering in an

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Leaping aboard a log he sent it shooting to the stream below.

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instant, however, the enraged animal made for Ace.

The Senator's son had that day worn his heavy leather chaps. He had found them burdensome enough on his slow climb upward. They now impeded him till he could not have outrun the animal had he tried, nor was there any tree handy between him and it.

Then a wild thought struck him. The log slide!—It was mighty risky, but then, so was the bull. Leaping aboard a log that still lay at the head of the slide, he pulled the lever and sent it shooting to the stream below, and the fallen pine needles flew out in a cloud before him, as the log hurled down the grade. His heavy leather chaps really helped him balance now, and his hob-nails helped him cling.

The log came to a stand-still before it reached the river,—but Ace did not. And the bull was hopelessly out-distanced.

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CHAPTER III

LIVING OFF THE WILDERNESS

ON every side stretched a sea of peaks. They might have been in mid-ocean, stranded on a desert island, had they not been on a mountain-top instead.

For one glorious fortnight they had camped beside white cascading rivers, and along the singing streams that fed them, following their windings through flower perfumed forests and on up into the granite country where glacier lakes lay cupped between the peaks to unfathomable cobalt depths. They had seen deer by the dozen feeding in the brush of the lower country,—graceful, big-eyed creatures who allowed them to approach to within a stone's throw before they went bounding to cover. They had thrown crumbs to the grouse and quail that came hesitatingly to inspect their camp site, protected at this season by the game

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laws and so unaccustomed to human kind that they were all but tame. They had crossed and recrossed rivers not too deep to ford, and rivers not too swift to swim. They had scaled cliffs where nothing on hooves save a burro—or a Rocky Mountain goat—could have followed after.

But always the shaggy gray donkeys had kept at their heels like dogs,—save when they got temperamental or went on strike,—waggling their long ears in a steady rhythm, exactly as if these appendages had been on ball bearings. The burros, five in number, had each his individuality. There was Pepper, the old prospector's own comrade of many a mountain trail, who, knowing his superior knowledge of the ways of slide rock and precipices, insisted always on being in the lead. This preference on his part he enforced with a pair of the swiftest heels the boys had ever seen. There was old Lazybones, as Pedro had named the one who, presenting the greatest girth, had to carry the largest pack. There was Trilby, of the dainty hooves, who never made a misstep. He—for the cognomen had been somewhat misplaced—was entrusted with the things they valued most,

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their personal kit and the trout rods. The Bird was the one who did the most singing,—though they all joined in on the chorus when they thought it was time for the table scraps to be apportioned. And finally there was Mephistopheles, whose disposition may have been soured under some previous ownership,—since the blame must be placed somewhere. Ace had added him to Long Lester's four when a lumberman had offered him for fifteen dollars. The name came afterwards. But though he sometimes held up operations on the trail, he was big enough to carry 150 pounds of "grub," and that meant a lot of good eating.

Despite their hee-hawing, however, the diminutive pack animals did a deal of talking with their ears. When startled, these prominent members were laid forward to catch the sound. When displeased, the long ears were flattened along the backs of their necks. If browse was good, they remained in the home meadow,—after first circling it to make sure there was no foe in ambush. If not, they wandered till they found good feed,—and one night they wandered so many miles, hobbled as they were, that it

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took all of the next forenoon to find them and bring them back to camp.

They could walk a log with their packs to cross a stream, or, packs removed and pullied across, they could swim it, if they were started up current and left to guide themselves. They would not slip on smooth rock ledges, they could hop up or down bowlders like so many bipeds. It was a constant marvel to Ace and Pedro what they could do. No lead ropes were necessary at all.

Long Lester was meticulous in their care. Every afternoon when the packs were removed he sponged their backs with cold water. And though the party was on its way by seven every morning,—having risen with the first light of dawn,—and though by ten they would have covered half of their average twelve miles a day, the old guide never watered them till the sun was warm, which was generally not till after the middle of the forenoon. For a wilderness trip comes to grief when any one member, man or beast, gives out, as he knew from a lifetime of experience in that rugged and unpeopled region.

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They had figured on about three pounds of food per day per person, for the four weeks' trip. That loaded each burro with a grub list of ninety pounds, and about ten pounds of personal equipment, besides the axes and aluminums and such incidentals as soap and matches. Ease of packing was secured by slipping into each of the food kyacks a case such as those in which a pair of five gallon coal oil cans come.

Their kit included neats' foot oil, (scrupulously packed), for the wearing qualities of their footwear along those stony trails depended in large degree on keeping the leather soft. No mosquito netting was necessary in the mountains,—it was too dry and cool for the insects,—but each member of the party had a pair of buckskin gloves, six good pairs of all wool socks,—worn two at a time to pad the feet against stone-bruise,—extra shoe laces, and a pair of sneakers to rest his feet around camp. Norris carried a pocket telescope, and Long Lester a hone made of the side of a cigar box with fine emery cloth pasted on one side, coarse on the other. They saved on blankets by doubling each into three crosswise,—except the old guide, who was too tall,—and on the higher, colder

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elevations they found that to wear a fresh wool union suit, and socks warm from the fire, to sleep in, was as good as an extra blanket, if not better.

Everything was to be turn and turn about, —Ace had been the most insistent member of the party in not leaving Long Lester to do the lion's share,—they were obliged, each in turn, even Norris, to learn certain fundamental rules of cookery. Long Lester got it down to this formula:

Put fresh vegetables into boiling salted water.

Put dried vegetables (peas and beans) into cold, unsalted water.

Soak dried fruit overnight.

To fry, have the pan just barely smoking.

To clean the frying pan, fill it with water and let it boil over, then hang it up to dry. Jab greasy knives into the ground,—provided it is not stony.

You can fry more trout in a pan if you cut off their heads.

As the boiling point drops one degree for every 800 foot rise, twenty hours' steady cooking will not boil beans in the higher altitudes

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unless you use soft water. They may be best cooked overnight in a hole lined with coals, if put in when boiling, with the lid of the Dutch oven covered with soil.

Three aluminum pails, nested, provided dish pan and kettles for hot and cold water. Butter packed in pound tins kept fresh indefinitely in those cool heights, and salt and sugar traveled well in waterproof tent silk bags. Long Lester had figured on a minimum of a quarter of a pound each of sugar and bacon per day per person, three pounds of pepper and twenty-five of salt.

Of course the one thing each member carried right on his person was a pepper tin of matches, made waterproof with a strip of adhesive tape. For the snow fields, they also had tinted spectacles, as a precaution against snow-blindness.

Axmanship came to be the chief measure of their campcraft. Ace had wanted to bring one of the double-bitts he saw the lumbermen using, but the old guide vetoed it as more dangerous to the amateur than a butcher knife in the hands of a baby.

The light weight single-bitt was the axe he had brought for the boys, reserving a heavier

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one for himself. These he had had ground thin, but so that the blade would be thickest in the center and not stick fast in the log. Both axe-heads wore riveted leather sheaths.

They took turn and turn about getting in the night wood. Fortunately the boys, (Norris, too,) had watched the lumbermen like lynxes, even Ted thinking to get a few points from them. They noted, for one thing, that the professional choppers struck rhythmically, landing each blow with precision on top of the other, working slowly and apparently at ease,—certainly untiringly,—and making no effort to sink the axe deeply.

They had also noticed that a lumberman will clear away all brush and vines within axe reach before beginning, lest the instrument catch and deliver him a cut.

They had learned, in logging up a down tree, not to notch it first on the top, then discover too late that they could not turn the thing over to get at the under side; but to stand on the log with feet as far apart as convenient, and nick it on first one side, then the other, with great nicks as wide as the log itself.

Pedro had to be shown how to chop kindling,

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as his first attempt resulted in a black and blue streak across his cheek where a flying chip struck him. Long Lester had to show him how to lay his branches across a log. And the old man insisted on his so doing, every time, for, he said, he knew a man who had lost an eye by failing to observe this precaution. He also barely saved the boys' axe from being driven into the ground by the well-meaning tenderfoot and nicked on some buried stone. But when he found the Spanish boy starting to kerf a prostrate log that lay on stony ground, he expressed himself so fluently that Pedro never again, as long as he lived, forgot to place another log under the butt, or else clear the stones from the ground around it.

The boys also learned to look for the hard yellow pine, when there was any to be found, for their back-log, but for a quick fire to select fir balsam, spruce or aspen. (Of course if they couldn't get these, they used whatever they could lay hands on.)

Pedro made the mistake, about this time, of tying a burro to a tree with two half hitches, which, when the burro tugged, were all but impossible to undo. After that he used the reg-

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ular hitching tie. As the burros were always turned out at night, without even a hobble save for the leader, it became necessary to be able to lasso them in the morning if they failed to come at call. There was also the diamond hitch that had to be acquired if each was to do his share with the pack-animals, all of which occupied fascinated hours around the night-fire.

So much for the first two weeks. It was now time to circle around and start back—some other way. Ace had done the packing the day they climbed above timber line for an outlook. As Trilby had cut her foot, (or his foot, to be accurate,) the boy had added her pack to that of broad-backed Mephistopheles, in whose kyacks he had—much against Long Lester's teachings—entrusted the entire remainder of their food. Pepper carried their personal equipment, and now that half their supplies were eaten, the Bird and Lazybones carried firewood for them from the wooded slopes below, that they might luxuriate beside a night fire. So far, so good.—But the peak of their night's bivouac was flanked by higher peaks that cut off their anticipated view, and before the little party could scale these, they must descend the

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gorge of another leaping, singing stream that lay between.

As the pack train followed nimbly down the glacier-smoothed slope, and along a ledge where the cliff rose sheer on one side, dropping as sheer on the other, Mephistopheles gave a sudden shrill squeal, and before any one knew what it was all about, went hurtling over the edge. The boys stared speechless as the luckless animal hit the cascades below and went tumbling through the rapids and over a waterfall, till the body was whirled to the bank and caught in a crevice of the rock.

Here they were, ten days' hike from the nearest base of supplies, and the entire remainder of their food,—they did not mourn the burro—three thousand feet below, or more likely washed a mile down stream by this time, what had not sunk to the bottom.

They might have been in mid-ocean, as Ted had remarked,—stranded on a desert island,—but for their trout rods, and one rifle. The game laws could be disregarded in their extremity. But they were days from the last deer they had sighted, and their main dependence must be on the fishing.

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Ahead, the trail wound down into a grove of rich tan trunks against the green of juniper. Gray granite worn into fantastic shapes,—castles and giant tables,—dwarfed and twisted trees rooted in rock crevices, white waters roaring against the canyon wall like a storm-wind in the tree-tops, fallen trunks, patches of flaming fire-weed.—This was the wilderness against which they must pit their wild-craft if they would eat.

By the time the sun slanted at five o'clock, Norris called a halt by the side of a moist green meadow where the burros would find browse, and all hands turning to and unpacking the kyacks, they hobbled the animals with a neat loop about their fore-legs. Then they cut, each of them, a good armful of browse for his bed. Long Lester strode off with his rifle in search of anything he might find for the pot, while Norris and the boys scrambled down to the river with their trout rods.

He broke trail along a narrow ledge, just such a one as the luckless burro had gone hurtling over when his pack scraped the rising wall. Almost a sheer drop, and the rapids roared in torrents of white foam. Pedro clung

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to every root and every rock crack for fear of growing dizzy.

"My fault entirely," Ace reproached himself, as he thought of the lost flour and bacon, rice, onions, cheese, smoked ham, dried fruit, coffee, canned beets and spinach, tinned jams, and other compact and rib-stretching items of their so lovingly planned duffle. "Never should have packed it all on one burro."

The Senator's son had a dry fly outfit that was his treasure. Ted used the crudest kind of hook and line for bait casting. The subject was one of keen rivalry between them.

"Dad always prayed: 'May the East wind never blow,' when we went fishing down in Maine," dogmatized Ace.

"Well, Pop was born in Illinois, and he used to say, 'When the wind is in the South, it blows your bait into a fish's mouth.' "

"Huh! That may be poetry, but we don't have much of any wind out here except the west wind. And if we wait for a cloudy day in this neck o' the world, we'll wait till September."

"All the same," insisted Ted, "trout do bite best when it rains, because, don't you see, the

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big fellows lie on the bottom, just gobbling up the worms the rain washes down to them."

"They won't rise to a fly in the rain."

"Well, I dunno anything about dry flies, though I sh'd think they couldn't *see* the fly up on the surface, with the water all r'iled the way it gets in a storm."

"No more can they when the sun glares."

'Well, then, you better choose the shady spots. I don't see sign n'r symptom of even a wind cloud to-day."—And yet, even as he gazed argumentatively at the horizon, a pink-white bank of cumulus began drifting into view in the niche between two distant peaks.

"Gosh! It's sunset already," exclaimed Ted.

"At half-past five?"—Ace peered at his wrist watch, then held it to his ear. "Besides, it's in the East——"

"Looks more like a fire starting off there," contributed Norris. "Whew! See old Red Top, there?"

"Red Top!—Where Rosa is?"

"I think it must be."

"Radcliffe's plumb worried, with the woods

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so dry, I'll bet," Ted surmised. "And short a coupla fire outlooks, at that, I heard there in the Canyon."

At this point they reached the mouth of the creek that had wriggled down from some spring, and Ace elected to follow it upstream with his Brown Hackles, which he dropped on the water with the most delicate care lest their advent appear an unnatural performance to the wary troutlets watching from the shady pools.

The slender stream raced dazzlingly in the reddening sunshine, as Ace tickled the placid surface of each pool, and the up-stream side of each fallen log, careful lest his shadow fall betrayingly across his miniature hunting grounds. He kept a good ten feet from the bank. And before the red glow had started climbing the Western slope, he had a full string of little fellows,—the prettiest rainbow trout he had ever seen.

Ted, sighting another creek, climbed back along the canyon wall to follow it down-stream with his bait can and his short, stiff willow rod, cut for the occasion with his good old jack-knife. His bait was the remnant of the ham sandwich he had saved that noon for the purpose,—

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though he had little dreamed at the time how much would depend on their next fishing jaunt.

Keen to out-do his chum by back-country methods, he pushed through the brush that made the gully a streak of green against the granite, until he came to a bend. Here, he knew, there would likely be a pool. He approached warily from above, lengthening his line. He cast well above the bend, so that his bait would sink to the bottom. He was rewarded at once with a bite. With a quick flip, he drew the fish away, and began his string.

For some time he followed down-stream before he saw another likely-looking place. An up-turned stump awoke his sporting blood. Safe refuge for a trout in more ways than one, it offered a 50-50 chance of losing his hook. But Ted lifted skyward at the instant of the bite, and all was well.

An eddy of foam, the shade of an over-hanging bowlder, then another upturned stump, (on these wind-swept mountain sides there were many such,) and Ted's spirits rose by degrees.

Meantime Pedro passed the rapids, climbed to a point well above, and selected a smooth green stretch of river for his operations. It

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had meant stiff going, and would mean more before he made his way back up the canyon wall, but something about their present crisis had challenged his reserves.

Pedro always used a spoon when he wasn't fishing for pure sport. On this sunny stretch, so clear in the red glow of approaching sunset that the bottom was plainly visible, he could see the fat old patriarchs lazing the late afternoon away. But he was soon rousing them to find out what that little shining thing could be that darted so rapidly through their habitat,—that tiny bit of metallic white so unlike anything their jaded appetites had yet negotiated.

The bright silver blade, only a quarter inch in width, perhaps three times as long, spun against the current, cavorting along jerk by jerk, (with time between jerks for the scaly ones to think it over,) soon began to get results. As the trout were all on the bottom resting till twilight should set in, Pedro craftily allowed the spinner to sink till it all but raked the bottom before beginning that tantalizing play.

Norris, too, tried a spinner, though he chose rapid water. There was one great beauty, green above and orange beneath, that baited his

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fancy. For some time he dangled the lure before he felt the heavy fish. Then a long rush, that sent his line whistling out like lightning, a moment's quiet, followed by another rush, and he had landed a great beauty of a five-pounder with the hook hard fast in his jaws.

After that Norris returned to camp, where Ace and Ted were already jubilantly comparing notes. Long Lester came in with a bag of birds and rabbits.

Of course their catch had to be broiled. Pedro arrived in time to join them in "which will you have, or trout,"—for the game had been saved for breakfast. The boys ate with relish, though without salt, and later listened to Long Lester telling tales with his boots to the bon-fire, bronze faced, nonchalant. At 8,000 feet, the air grew noticeably cooler with the turning of the wind down-canyon, and the boys heaped down-wood liberally in a pyramid. The dry evergreens snapped in a shower of sparks as the full moon, silvering the snow-clad peaks, deepened the shadows under the trees.

On the fragrance of crushed fir boughs they finally slept, all thought of the morrow drowned in dreams.

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Out of the painted sunsets and yellow sands of the Salton Sea, land of centipedes and cactus, blistering sun, and parching thirst, and all things cruel and ugly, had come Sanchez, a Mexican, with his son and an old man who had been his servant, to lay ties for the narrow gauge railway that was to zig-zag up the canyon walls for a lumber company.—King's Lumber Company had fired them for reasons that will appear. Suffice it now that all their blistering bitterness and parching hate had focused on these forests.

Rosa, alone on the Red Top fire outlook scaffold, had seen a pin-point of light the night before that she took for a camp-fire, but whose, she could not know.

Breakfast, such as it was, disposed of, the four deceptively meek looking burros were lined up in the lupin perfumed meadow, in semblance of a pack-train, (the hundred pounds of duffle divided between them that they might make faster time, as well as a safe-guard against further accidents.) A committee of the whole now decided they must catch more fish and dry them, then lead a forced march to Guadaloupe Rancho, and if they found range cattle, they

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would bring down a calf and square it later with the owner.

For two days Norris, Ace and Ted caught fish, while Pedro dried them, and Long Lester scoured the woods for game birds, rabbits,—anything and everything he might find. Then came two strenuous days during which they bore in the general direction of Red Top.

Without warning, they came to a sheer ledge fringed with minarets, and stared across a glacier-gouged canyon a mile wide. Progress in that direction was effectually checked. They found themselves with a view of such miles of snow-capped peaks that they stood speechless, with little thrills running up and down their spines at the sheer beauty of the scene.

To the right, the way was clear across a rock-strewn elevation where the only trees were squat, twisted, with branches reaching along the ground as if for additional foot-hold against the never-ceasing trade winds. Again they were brought to a halt by a peak of granite blocks.

"Do you know, fellows," said Norris, suddenly, "mountain-building is still going on, under our very feet."

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"Is there going to be an earthquake?" gasped Pedro.

"There are likely to be slight earthquake shocks any time in this region. The last big 'quake, that caused any marked dislocation, was in 1872, though, so we have nothing to worry about. But I'm going to be able to show you some rock formations that will illustrate what I was telling you the other day."

"You mean," brightened Ace, "showing how these 14,000 foot peaks attained their present height?—How there were two up-lifts?"

"Yes, and we are standing, this very minute, on a basalt step that some earthquake has faulted from the main basalt-capped mass. Just see how the whole story is revealed right there in this gorge! You can see the streaks of basalt, which we know lie in horizontal layers, and rest on vertical strata of the Carboniferous and Triassic age."

"Whoa — there!" groaned Long Lester. "Would you mind telling us that again, in words of one syllable? I calc'late it must be a mighty interesting yarn, from the hints you've let out now and ag'in, but how'n tarnation——"

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"Yes," grinned Ted, "do tell it, Mr. Norris, so's Les and I can get it too."

" 'Bout all I've got any strangle hold on," complained the old man, "so fur, is thet these yere valleys was gouged out by the glaciers, a good long spell ago.—Now there's one thing I'm a-goin' to ask you, Mister, before we go any further. What did you mean by that there—coal age?"

"That," vouched Norris, "was when most of the coal was formed, away back before man appeared on earth,—before there were any of the plants and animals as we know them to-day.

"Picture a time when the water was covered with green scum, and the air was steamy, when the swampy forests were composed of giant ferns and club mosses and inhabited by giant newts and salamanders, dragon-flies and snakes."

"How—how do you know all thet?" gasped Long Lester.

"Partly by the fossils. It's a big study,—geology, we call it,—and the scientists who reason these things out use what has been discov-

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ered by astronomy and chemistry and a lot of other sciences. It's a long story."

"But a *thriller,*" Ace assured them, as Norris lighted his pipe on the lee of a bowlder. "Can't we rest here a few minutes, Mr. Norris? Those burros were about winded. Can't get 'em to budge yet. Come on, fellows, snuggle up," as Norris seated himself compliantly, back against the bowlder. They all crept close, for the wind was blowing hard.

"Where did this earth come from in the first place?" asked Ted.

"Well, of course you know that our sun is only one of millions of stars, and very far from being the largest, at that. Some larger star, in passing the sun, by the pull of its own greater gravity, separated some large fragments from that fiery, gaseous mass, and started our planetary system.—We don't want to go too far into astronomy."

"But astronomy shows you how they know all this," Ace assured the old man, who appeared divided between wide-eyed amazement and incredulity, (as, indeed, were Ted and Pedro.)

"Our earth, like the other planets, was one

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of the knots of denser matter on the two-armed luminous spiral which began circling the sun. There were smaller particles which were attracted to the earth by earth gravity and which increased the size of the earth till it was far larger than it is now. Ever since, the earth has been shrinking periodically, and when it shrinks, its surface becomes wrinkled, and these wrinkles we call mountain ranges."

"Of course," interpolated Ace, shining eyed, "the crust of the earth got cooled, while the inside was still a mass of molten metal and gas, which kept boiling over on to the crust,—couldn't you say, Mr. Norris?"

"You've got the idea."

"I s'pose that's *the hot place!*" chuckled the old man.

"Probably where they got the idea.—In time the metals and heavier substances sank, while the lighter ones rose as granite rocks, till there was an outer shell miles thick.

"The Valley of Ten Thousand Smokes, in Alaska, is a volcanic region where the ground is hot and breaks through with one even now, —I was there several years ago,—but generally speaking, this earth has a crust 150 miles thick.

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"As I was saying, the continents are built of the lighter granite, chiefly, while the oceans lie on the heavier basalt."

"But I thought you said we were on a chunk of basalt now," said Ted.

"We are. You know the Pacific has flowed where now you see these peaks, as the high lands have been worn down between successive upbuildings."

"But—where did the water in the ocean come from in the first place?" marveled the old prospector.

"Out of the earth," smiled Norris. "Up through hot springs, geysers and volcanoes. The water vapor was always here, you know, —mixed with the molten rock and gases."

"I swan!" ejaculated the old guide. "I thought I knew something about rocks, but—this beats anything in my kid's fairy books."

"You bet!" Ace agreed. "You just wait till you hear——"

"I expect we'd better start on now," Norris rose. "Do you chaps realize what a predicament we are in?" and shading his eyes with a lowered hat brim, he peered off across the hum-

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mocky granite slopes, which shone mirror-like in places under the noon-day sun.

A moving speck in the sky to the North drew an exclamation from him. In another moment a sound that increased to a hum like that of a giant motor-boat descended from the skies, and the speck disclosed itself as a mammoth aeroplane.

"Signal them!" cried Norris. "What can we signal them with? Get out your pocket mirrors, quick!"

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CHAPTER IV

WITH THE AIR PATROL

"SIGNAL them!" chorused the three boys, acting on Norris's suggestion, (flashing their distress with their pocket mirrors,) while Long Lester stood measuring the flight of the aeroplane.

His practiced eye also detected a faint bluish haze that rose behind the ridge at the North,—a haze altogether unlike that which foretells a storm. In fact, the sun glinting from the wings of the giant wings and from the glacial-polished slopes beneath forbade that explanation.

Like most backwoodsmen, the old prospector said the least when he felt the most. His lean body suddenly grew tense. "It's a fire," he told himself. "An everlastingly big one, too."

"That's a DeHaviland," decided Ace, as the huge bombing-plane came nearer. "Must be the Fire Patrol!"

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A moment more and the buzzing apparatus began sinking into a "pancake" landing,—fortunately, just above the wide sweep of the granite butte. Could it be engine trouble, Norris wondered, or had it seen their signals? Lucky they were on an elevation.

With the sound like a saw-mill in full blast, the great ship jolted to terra firma, within shouting distance,—and hardly had she come to a full stop than the boys had raced to her side.

"I say!" exclaimed a familiar voice, as the observer climbed out.—It was Ranger Radcliffe! "Where did *you* folks drop from?"

Norris explained the marooned camping expedition.

Radcliffe's face was lined with fatigue and anxiety. "Big fire off there!" he motioned. "Been directing a hundred men. Broke out in three places, all within twenty-four hours, and not even an electric storm to account for it. Want to help?" And as the little party voiced unanimous consent, he proceeded to draft them in, at the Government nine dollars per day.

He could have compelled their services, as he had that of a party of campers down towards

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Kings' River. In a few words, his voice vibrating to his high nervous tension, the young forest officer had them all thrilling with patriotic fervor.

"Now get your things," he directed. "May have to fight it for a week! You can turn your burros out to forage for themselves, and I guess you'll find them again when this is over. If you don't the Government will probably square it with you."

The chums swiftly retraced their steps to where the animals waited patiently, removing the packs and sending the little donkeys down the trail to better pasturage. They might wander, but they would be safe. With their swift heels they could defend themselves from even a mountain lion. And they were apt to keep to the mountain meadows, where was food and water.

Their run at such an altitude had given Pedro a touch of mountain sickness, and he had to lie flat till his heart beat more normally and his nose stopped bleeding.

The big 'plane carried a relay of provisions for the fire fighters already established, whom it had brought for the purpose from the Zuni

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Mine. As corned beef and hardtack were distributed, the hungry campers thought they had never tasted anything so good in their lives. Not even the Thanksgiving turkeys of later years were ever spiced with such appetites.

This fire,—or rather, these three fires, so mysteriously concomitant, the Ranger explained when the boys returned, had broken so far from any ranch or work camp that they were hard pressed for men to fight it.

"You fellows will have a mighty important part to play for the next few days," he assured them, "or I miss my guess."

"Hurray!" shouted Ace. "Three cheers for the U. S. Airplane Patrol!" For he knew something of the work started at the close of the war. Following regular daily routes, this patrol not only detects fires and follows up campers or others who may have started them, (carelessly or otherwise,) but in times of emergency carries the fire leader from one strategic point to another,—where as likely as not there are neither roads for him to go in his machine, nor even horse-back trails,—till he has shown the volunteer firemen how to trench and back-fire.

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They needed some one, the Ranger said, to hold the top of the next ridge,—between which and the boys lay that inaccessible canyon it would have taken them days to have scaled afoot. By day they were merely to watch for flying brands. Their chief work would come at night, when the wind would turn and blow down canyon, and they might successfully back-fire.

The fire had started in two places on the opposite bank of the Kawa, and in one place this side of the river, and was eating its way along the slopes with the wind which swept them by day. It certainly looked like the work of incendiaries.

Ace begged permission to wireless for his little Spanish 'plane, in its hangar in Burlingame, that it might be employed in some volunteer capacity, and Radcliffe accepted his offer.

The huge DeHaviland required all of the flat surface afforded by the butte, for its preliminary run. They were off with a roar. As they glided across to the flat-topped ridge on the other side of the canyon, they could see the ravenous flames climbing tall pines and firs racing from limb to limb, through the forest

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roof, devouring the steeps, doubtless richly coated with underbrush and downwood. The roar and crackle of it filled their ears sickeningly, as they thought of the naked mountainsides that would be left,—mere skeletons of barkless tree trunks, where they had camped on brown pine needles,—smooth, silent, inches deep, soft under their tired feet, dry as tinder and aromatic with Nature's finest perfume.

How the devourer would relish the pitch and resin oozing from the juicy bark! How secure it must feel, on those slopes never climbed by man, with the autumn rains months away, and the fire fighters like so many ants trying with axe and shovel to mark off on the hot forest floor a boundary beyond which the fiery tongues must not lick.

Had the wind not been in the other direction, they would have been overwhelmed with the smoke that billowed darkly till it could have been seen 50 miles away, the red sun scarcely lightening the gloom. Even where they landed, an occasional hot breath scorched their faces and set their eyes to smarting, while their winged ship nosed frantically up and away again before she should meet Icarus' fate.

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"Some day," Radcliffe had told them that day at the rodeo, "the Forest Service Air Patrol, which serves now to give warning of the tiniest smoke, and so saves men and millions where every minute counts, will fight with glass bombs of fire extinguisher, whose trajectory falling from a 'plane in rapid flight will have to be calculated to a nicety, but which, delivered while the fire is in its infancy, will do the work of many men."

The worst difficulty would be at night, when though the fire shows plainer, the pilot would have to depend largely on his own sense of equilibrium to tell him at what angle his ship was inclined. True, acetylene gas lamps properly protected from the wind could be made to light up the ground below when alighting, but at an altitude of even a mile, little can be seen of the landscape to guide one on one's course. The 2,000-foot firs of the Sierra slopes appear but as green-black billows.

As the great ship raced toward the flaming forest, their talk at the barbecue raced through the mind of the Senator's son. "Some day," Radcliffe had challenged them, "you want to see Glacier National Park, with its ice-capped

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peaks and its precipices thousands of feet deep, its glacier-fed lakes and Alpine scenery. And of course you must all see the geysers of the Yellowstone, its petrified forests and mud volcanoes."

"And bears?" Ted had laughed with a glance at Pedro.

"Yes, all sorts of wild animals. And some time you want to explore the cliff dwellings in Mesa Verde and the 14,000 foot peaks in Rocky Mountain National Park. By that time you will be ready to go to Southern Alaska and try Mt. McKinley, which is worth while not so much because it is the highest mountain in North America, (Mt. Whitney is nearly as high,) but because it stands the highest above the surrounding country of any mountain in the world. Mt. Whitney is just an easy climb above a sea of surrounding peaks; you don't realize the height at all.

"Then you know we have a National Park in Hawaii?—But Roosevelt,—or Greater Sequoia Park,—is going to remain an unspoiled wilderness for a good many years to come, with three great canyons larger than that of Yosemite itself."

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"Kings' River and the Kern," Ace had agreed, "but what is the third?"

"Tehipite."

"Oh, of course."

"We wanted to go over the John Muir Trail right along the crest of the Sierras to Yosemite."

"You've hundreds of miles of almost unexplored country! Enough vacation places to last a lifetime! Rivers alive with trout! Bears! Cougars!" the Ranger had commented.

"And rattlers," Long Lester had added grimly.

"And rattlers. And they're the only living thing we need fear."

"Not excluding range cattle?" Pedro had wanted to be assured.

"Not when you're all together. Of course if you were alone you might break a leg or something that would leave you helpless, and you'd sure be a long way from anything to eat unless you had it with you.

"But unless we look alive the Big Interests are going to wrest away these beauty spots that we have set aside for our National playgrounds," Radcliffe had declared.

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"That's just what Dad says!" Ace had remembered.

"And why? Not because they need the irrigation and water power of the big falls, for they can have it after the streams leave the parks, but because it would cost them a good deal less to secure these things of Uncle Sam than it would to build their projects outside Park limits. There isn't a beauty spot in the West that some commercial interest hasn't designs on."

"That's one thing I mean to fight!" Ace squared his chin as the DeHaviland whisked them to their particular ridge, a table mountain, or butte, where half a dozen recruits had already been landed with tools and grub.

"Sure seems as if these fires had been set," mused Long Lester, as Radcliffe bade them good-by,—for he had to be in a dozen places at once, that day.

"But who did it?" demanded Ace fiercely.

"No savvy dat kind feller," said a Canadian half breed, who was just starting off with a pick. " 'E's bad feller, dat!"

"Sure is!" agreed Ace. "I don't savvy him either,—any one who would deliberately burn—

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that!" with a wave of his arm toward the forested gorge, up which already rose a noticeable heat. The red tongues, racing through the spruce and cedar tops, shone through the smoke gloom, whence issued a distant roaring which was the wind created by the super-heated stretch of territory.

To the left, a gleaming eyed cougar crept through the shadows, himself a shadow. To the right, a huge, furry looking shadow ran clumsily, flat-footedly. A tiny shadow hopped from almost under their feet, and above their heads flapped a small covey of lighter shadows. Writhing above the dark tops of the doomed trees rose the yellow-gray smoke that was their departing shades.

The faces of the fire-fighters were grimly blackened with smoke and grime, their shirts clung wet with perspiration to their swelling muscles, and their dry throats clacked when they tried to swallow.

"I'd sure like to find the fellow that started *that!*" muttered Ace.

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CHAPTER V

A DARING FEAT

AS sun-set turned the wind down canyon, all hands made a sally down the mountain side in the hope of establishing a line of back-fire, but the ground soon became too hot for them, while the air was filled chokingly with ash and char-dust. They had to retreat to the ridge. It was a night never to be forgotten.

When the wind turned at dawn,—with their line still intact,—the exhausted party took turn and turn about, snatching a few hours' sleep, wrapped in their blankets on the rocks, or making coffee.

Ace had forgotten all about his wireless message when, shortly after noon, his own ship arrived. It had had a search for him, and had landed, apparently, on the very ledge of basalt where the DeHaviland had picked them up.

The beauty of the Spanish ship was that it

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was built to land on a space no bigger than a house roof. It carried two propellers at the top. The pilot had only to start these and it sucked itself straight up into the air. Then he twirled the propeller on the front and sailed away, as easily as you please.

He landed by reversing these operations. He could alight on a shed roof if he had to, (provided, of course, that the roof was flat.) The only danger would be if the propellers should go on strike.

"I've been getting a wireless message," said the pilot. "There! Better take it, Mr. King," to Ace.

Ace's eyes grew dark as he interpreted the frantic ticking that his apparatus gave him. "Why—*Rosa's* sending this!—She's marooned —there at the Red Top fire-outlook!—'Fire on three sides, on fourth, rapids of Kawa River Gorge. Send help—if you can,' " he translated, while the boys waited, breathless. "Three men where first-fire started—silver buttons—shining in the sun."

"That sounds like Mexicans!" said Pedro.

"Now what?" asked Norris. "Where's the Ranger, do you suppose?" But just then he

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saw a flaming branch blown across their line. Like tinder the dried firs burst into a shower of sparks, and with a call to the men, he darted after it. Ace remained behind to wireless, and Ted to quench their cook-fire, while Ace's pilot flung off his coat and ran after the fire fighters.

Ace King did one thing supremely well. He knew his ship. He was born to fly.

"Hey, Ted," he brought a certain line of reasoning to a head, "the Ranger can't *land* with that DeHaviland, if he does go after Rosa. You know the lay-out on Red Top." (The boys had passed that way.)

"Yeh,—Cæsar!—That's right. No place there half large enough for the bombing-plane! —That poor kid!" He shuddered. "What's the answer?" for he saw that Ace had some plan. "I'm with you!"

"Just this.—We can't leave her there to be burned alive. Radcliffe can't do any more than we can about it. Besides, he's got his hands full, wherever he is. But a forest guard was *killed* last year directing fire fighters from a plane. Went into a tail spin and fell into the flames."

"I know. It's mighty dangerous flying over

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a fire. Isn't there anything Rosa can do?"

"That's just what——" Ace hesitated, deep in thought.

"I've heard of people taking refuge in caves, but where would she find the cave?—'N I've heard of 'em going to a rock-slide and piling up a barricade of stone and lying behind it while the fire swept that way. It cuts off some of the heat and flying sparks——"

"Look here!" Ace vociferated with the suddenness of a machine gun. "I'm going for her."

"What——!"

"Yes, sir! I can land there, anyway. Then if it queers the machine, I'll take Rosa down to the rapids. I know a fellow that was in a big fire in Montana. When it cut them off, each man soaked his blanket and got under it in midstream while the fire jumped to the other bank. They made a sort of tepee around their heads, got clear under water, and just came up for an occasional breath.—Gee! He says it roared like a thousand trains as it swept over them. So that's what we'll do—that is, unless we can get back in the ship."

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Unconsciously he patted his machine, and Ted knew what it would mean to him to lose it.

"Perhaps—perhaps you *can* bring it back," he ventured.

"Sure thing!" Ace gave his spirits a toss. "Anyway, here goes!—Good-by."

"What's the idea?" yelled Ted aggrievedly. "Going to leave your side-kick behind?" and he climbed into the observer's place.

"Coming!" Ace wirelessed the girl. "Be on meadow—we'll pick you up."

"If our propellers don't go on strike," he added to himself. Still he knew he could slow to 80 miles an hour and pancake down. He would first circle well away from the fire, with its super-heated air column, till they came to the gorge of the Kawa. There would be a narrow zone, he figured, of less destructive atmosphere, the air channel over the 2,000 foot canyon.

With a peek at castor oil and gasoline, they started, looping and curving straight to 15,000 foot, then Westward, away from the fire zone. Though the day was fair, the spiral of hot air rising above the flaming forest kept them pitch-

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ing and lurching in a short chop that made Ted look green, and gave even Ace a cold feeling at the pit of his stomach.

The sea of snow-clad peaks slid by beneath them, the sun flashing from the granite slopes. Rising and falling, rising and falling in the rough, upper air, they felt as if they were in a swift elevator. A cloud to the West looked like a fleecy carpet beneath them. The West wind kept swinging the machine till Ace had continually to bring it back in line with the rapids of the Kawa which was his objective point.

It took but instants, though it seemed ages to both boys. Now it was time to race quivering down the gorge of canyon-cooled air.—Would they make it against the devastating breath of the flames?—Now they were looking straight down into that picture of red and—black. Rosa, watching frantically from the wee patch of green which was her mountain meadow, looked like a dot with waving arms. The air became a stretch of dizzy rapids. The combined roar of the flames and the river beneath nearly drowned the nearer sound of the descending 'plane.

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Raced quivering down the gorge of canyon-cooled air.

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With heart that fluttered near to bursting, Ace accomplished the quick swoop, Ted snatched the girl aboard, and they were up again.

The miracle had been accomplished!—The mountains lay like a relief map beneath them, greenest down the canyons that branches Westward from the gleaming crest of the main divide, the snow-capped peaks gleaming silver in the sunlight. The fire zone lay like a small inferno behind them.

Back at fire-fighting headquarters, Ace's nerves took toll of him in trembling knees. He had been all steel. Now he literally dropped in his tracks, and in ten minutes was fast asleep.

Rosa, now that the danger was all over, broke down and wept hysterically, to Ted's infinite embarrassment.

Norris was just returning with the triumphant fire-fighters. They had actually not missed them. When, four hours later, Ace awoke and responded to Pedro's "Come and get it!" as he ladled out the ham and beans, he found himself a hero, and Ted his press agent.

"This country would do well to emulate France," Norris was explaining. "France offers a government subsidy to encourage com-

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mercial aviation. Our Congress has thus far refused to realize the need of appropriations. For it is by trade that aviation will develop.

"We need above all things more airplane fire patrols. We have the men, trained aviators left from the war,—we have the equipment, and the men could protect not only our National Forests, but at the same time keep a watchful eye on the millions of acres of state lands and timber privately owned, which lie adjacent to Government holdings.

"Do you fellows realize that in five years, areas have been burned that would more than fill the state of Utah? At that rate how long will our forests last? And think what a paper famine alone would mean!" He paused for lack of breath to express the intensity of his feeling.

"Hundreds of men have given up their lives in the service,—fighting fire."

"Yes," said Ace, "but Dad says there's a bigger fight to put up in Congress for forestry appropriations."

"Your father is doing good work," stated Norris.

"He's trying to, you bet!"

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"These fire-fighting 'planes can sail over the highest peaks in the United States. They can travel 14 hours without a landing. They can communicate with those below by radio. And they don't have to have smooth landing places, merely ground that is free from stumps.—We have over twenty million acres of National Forests alone, (not counting those in Alaska,) and they are worth $220,000,000."

"Gee! And there's just as much risk as in dodging enemy 'planes," Ted enthused, "flying over fires, and finding landing places when your motor goes on strike." His eyes glowed across at Ace.

"Huh, you're safe enough above a thousand feet," minimized Ace, modestly. "These accidents practically all happen below a thousand feet."

But by now supper was eaten, and it was time to get back to work. Norris, acting on Radcliffe's suggestion, had been stationing the men at intervals to back-fire as far down the ridge as they could stand the heat. If anything, the fire seemed bigger than it had the night before, —a maelstrom of the inferno.

They worked in pairs, Ace being his, Norris's,

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right hand man. He now assorted the six miners along the slope, planning himself to take the extreme Western post, where the ridge ran lowest and where the rocky crest dwindled to a dangerous line of mountain pines.

Ted and Pedro he directed to the opposite end of the ridge, where, like the tooth of a comb, it joined the main crest of the Sierra,—another strategic point.

"If worst comes to worst," his final words were, "take refuge in some cave. This is a limestone region,—as you may have noticed,—and it's likely riddled with caves. Keep an eye out for indications of cave mouths. I saw one yesterday, somewhere down there, when I didn't have time to investigate."

"All right," acquiesced the boys, though inwardly scorning the possibility.

Rosa remained at camp to have food ready for the men on their return.

She began by taking stock. There was flour and lard, but no bread. She would have to bake for eleven hungry men. There were rice, beans, onions and tomatoes, dried fruits and coffee, and fresh meat for one meal, and for the next,

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erbwurst and pickles, macaroni to be baked with cheese, and tea. She hoped—for more reasons than one—that the Ranger would bring more supplies. She got out the Dutch oven and the gallon coffee pot, and with the hatchet provided with the outfit, started getting in a supply of down-wood.

As on the day of the rodeo, she was attired in trim khaki riding breeches and high-heeled moccasin boots,—good on horse-back but mighty hard to walk in, where the ground was rough. Her bobbed curly hair, red silk blouse and fringed sash added a touch of the Rosa that underlay her gritty side. She would surprise Radcliffe with her ability to cook for a fire crew.

The huge loaf safely ensconced in a Dutch oven buried in red coals, she sallied forth on a little exploring expedition. She wished she might find some fir sugar to cap the feast. She had, once, when camping in the Thompson River Valley. She had found the delectable sweet on a Douglas fir. Some of the dry white masses had been all of two inches long, though most of it had been in the form of mere white drops at the tips of the needles. There had also been

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a quantity of it in a semi-liquid condition on the ground underneath the tree, where some rain had dissolved it from the branches.

Just where should she search? The Indians had told her that time to look on the dry Eastern slopes of the range, in open areas where the trees got lots of sunlight, but where the ground has not dried out too quickly after the spring rains, as moisture is necessary as well as sunlight,—(so long as it does not rain and melt off this excess of the tree's digested starch.) She had a hunch that she could find some on the desert side of the Sierras, that being, of course, unattainable—unless Ace could take her over in his 'plane.—It would do no harm to look on this side.

Neither did it do any good. She returned to camp empty-handed save for some cones of the sugar pine, which she proceeded to roast that the nuts might fall out of the spiny masses.

She found the deserted camp over-run with chipmunks. The little striped rascals had ravaged all the food supplies they could nibble into. She watched a couple of them actually shoving on the tin lid that she had left insecurely loose on the syrup can. Finally sending it clattering

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to the stony ground,—as she watched from behind two trees that grew close together,—the wee things sat up there on the edge of the can, dipping out its contents with their hand-like paws and licking them. Then one tried to reach down and drink it outright, at which he fell in, and Rosa felt impelled to fish him out and launder him,—to his terror,—before turning him loose, then put the syrup on the fire to sterilize.

Meantime what of the fire fighters? Ted and Pedro, with their pick and shovel, had descended rapidly into that deathly silence of the doomed forest slopes, deserted alike by song birds and chipmunks, the hum of insects and sound of any living thing, save alone the never-ceasing roar of the ravenous flames.

The fire had been eating slowly through a stretch of manzanita chaparral, whose hard stems resisted them as the evergreens could not. Though the wind still blew up-canyon, they approached the river gorge at right angles, and were able to make their way to the lower levels in the shelter of the East side of a dry creek bed, where the hot blast could not reach them.

They were stooping to drink at a spring when the terrified neigh of a horse sounded from a

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clump of saplings almost behind them. In the same instant the stretch of seedling firs that clothed the creek bank, showering into sparks at the far end, shot toward them sky rockets of leaping flame. Turning in a panic to race out at right angles from this unexpected peril, they thought to make time on horse-back.—The animal was tied and hobbled with a rawhide lariat!

Frantically the hobbled horse jerked at the rawhide.

Pedro plucked Ted by the arm and tried to drag him on, for the fire was snapping through the under-brush at the speed of an express train.—Its sound was that of many trains, and its wind hot as the breath of a blast furnace.

But as Ted had stooped to cut the thongs, his parched nostrils had caught a cooler breath. It seemed to issue from a cranny in the rocks behind the clump of saplings. Then it was too late: The shooting tongues of red were upon them. Dragging Pedro down beside him,—for the roar drowned his voice,—he waited, reasoning that the two- or three-foot seedlings would go like tinder, leaving a strip of ground hot, to be sure, but no longer flaming.

If they could but endure its passing! He

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turned to press his scorched face against the rock wall.

To his amazement, he fell into a cave mouth, tripping Pedro, who stumbled after him. Quick as thought they dragged the horse in after them and held him, trembling and snorting, his eyes rolling wildly, during that blistering moment until the line of fire had passed them.

"We're safer now than before," declared Ted. "This made a fine back-fire, didn't it?—Let's rest awhile." His nerves were taking toll of him. "Ground's too *hot yet* anyway."

For perhaps an hour they rested, flat on the floor of the cave,—after having tied the horse to a bowlder just outside. He was a fine animal, black as jet and as high-spirited as Spitfire himself. Ted appraised him with longing eyes, for he loved horses as Ace loved his ship. But who could he belong to, and how did he come to be there?

His bridle was embellished with silver. "Mexican handiwork, that!" Pedro thought. But the mystery was no nearer solution.

The answer came sooner than they expected.

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CHAPTER VI

THE INCENDIARIES

THE red glow of the sun on the snow-clad peaks of the main ridge had begun glinting through the smoke gloom when voices seemed to echo from within the very rock against which they were leaning. The boys crept to look behind it. Then their eyes rounded in astonishment. As Ted would have spoken, Pedro clapped his hand over his mouth with a look that bade silence. Crouched motionless at the side of the cave mouth,—for a deep cave it now disclosed itself,—the two boys peered at the spectacle that greeted their eyes.

Three Mexicans, aglitter with the silver buttons of their native costume, appeared suddenly from some black depth, carrying torches.

With these one of their number kindled a bonfire, whose flame revealed a couple of burros standing patiently under their packs, tied to a

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mammoth stalagmite. For the red flare behind the three figures of the Mexicans, showed a cave roofed with amber-tinted icicles of smoke-stained rock, beneath which up-rose for each a pyramid of the same formation.

The Mexicans might have been father and son and old servant, from their general appearance and from the fact that most of the work of supper-getting was performed by the shabby, white-haired one, while the fat middle-aged one struck the younger a blow that was not reciprocated. They were talking in a tongue that Ted could not translate, though from the peppery tone of it, he judged they were quarreling. Pedro assured him later they were not. (He knew Mexican.) They were merely regretting that their horse had been burned.

The fat one, evidently too fagged to move, was demanding that one of the others go see for sure, while they argued that it was no use, the animal could not have survived. They must have been exhausted, lame, besides, to judge from the creaky way they moved. The fat one poured some verbal vitriol on their heads for not having brought the horse inside, while the

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white haired one deprecated that they had not intended to be gone so long.

"It's the fat one's, and now he'll have to hoof it like the others; he'd sure break the back of a burro," translated Pedro in huge enjoyment, to his mystified companion. "Wonder if they're the fire bugs Rosa saw?"

"Let's listen and find out," said Ted.

As the blaze by which they dried their mysteriously muddy feet died down to red coals, from the pack of one of the burros the old peon extracted some ready-made tamales and proceeded to add the heat of cooking to the hotter peppers within their enwrapping corn husks. This fiery mixture they quenched from a round-bellied bottle passed from lip to lip, though the fat one took his first and longest.

"They're the fire bugs, all right," said Pedro softly into Ted's ear. And it was agreed that they might safely creep in along the shadows till Pedro could hear more plainly.

Sanchez was the name of the fat leader, and his son and his servant the others proved to be. They had, it developed, a grouch against the lumber company down on the Kawa, (in which, as it happened, Ace's father had an interest.)

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They had been fired from the crew, and no punishment was too great for a company that would do that to a workman who merely asked his accustomed afternoon siesta.

"*Detestablemente!*" (And other remarks that sounded like fire-works.) The pigs of *Americanoes!* Pedro convulsed Ted with his recital when they had crept back to the cave mouth, despite the seriousness of the situation.

That they would start more fires at their first opportunity had also been established by their conversation.

"We can't let 'em go," argued the ranch boy.

"We can't capture them," the Castilian was as positive. "We are unarmed, and they have their daggers."

Ted pondered, peered out at the still, smoking ground, soothed the nervous horse, then came to a conclusion, which he unfolded to his comrade.

He must go for help. He would ride that horse, find Norris, get Ace to wireless Radcliffe, and summon help. But—he eyed Pedro doubtfully, knowing his uncourageous bearing at the rodeo.

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"But what?" insisted the Spanish boy. But had he not guessed it? Of course he would remain behind to keep track of the desperadoes.

But how could Ted start with the ground so hot? He would have to wait awhile, then make up for lost time by break-neck riding.

So be it.—They were hungry now, and ate the ration of tinned corned beef and hardtack from their pockets. Ted also fed the horse some hardtack, and brought him several hatfuls of water from the spring,—scorching his soles as he crossed the charred ground.

Pedro propped his tired body in a sitting posture with one ear cocked for the conversation within. Ted flung himself flat on his back in the smoky gloom, which obscured even the light of the moon. He was mentally exploring that cave,—remembering what Norris had once told them of the region and wondering into what limed recesses the Mexicans were likely to retire when capture threatened. That the cave had its depths he felt assured by their having so suddenly appeared with their torches. And what could Pedro do if they tried to leave before help came?—My, but he must ride! Three such incendiaries loose in those dry forests, and

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there would be no end to the harm they could do!

The limestone of which these caves were formed,—sediment of the shells of myriads of sea creatures,—had been deposited in the primeval ocean that once flowed over that whole region from the Gulf of California. Uplifted by contractions of the earth crust, it had been cut as the surrounding granite could not have been by the percolating rains and streams, flowing along the cracks of the uplift.

This cave was probably a network of water-worn passage-ways extending no telling how far underneath the ridge. There were reputed to be caves almost as large as Mammoth in these unexplored recesses of the Southern Sierras. Could this be one of them, or was it just a two- or three-cavern affair, he wondered? On that depended a very great deal of their success in the coming capture, for once entrenched within these labyrinthian caves, the Mexicans could hold them at bay until they had made good their get-away. It had been so, he had been told by military men, in chasing Mexicans over the border.

Perhaps there were other caves in the region.

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Where, indeed, had these men secreted themselves while the fire had raged in a semi-circle about them? In a cave, the air would be damp and cool, no matter what was going on outside, and they could have been genuinely comfortable with the inferno raging over their very heads. —Unless, of course, the smoke suffocated them! That would all depend on the air passages that fed their particular cavern. Some of those caves across the Mexican border were miles in extent, and had exits galore.

Pondering the pendant stalactites that had gleamed like onyx in the firelight, he pictured the water percolating drop by drop through the limestone crevices, dissolving the lime and forming the stalactites a drop at a time through the years. How wonderful it was! He wished he too might study. Perhaps, if he could make a go of his mother's fruit ranch?—He was half asleep. He roused himself by trying to recall what it was that Norris had told them about stalactites.

The rain water, charged with the carbonic acid gas of the atmosphere, seeps in from the surface and falls drop by drop. Each slow drop remains long enough upon the ceiling to deposit

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some of its dissolved lime in a ring to which the next succeeding drop adds another layer.

In time this ring lengthens into a pipe-stem of soft lime. It fills and crystallizes, thickens and elongates, as the constant drip, evaporating from the outside, deposits more and more of the lime. Thus these stone icicles are formed, sometimes an inch a year.

At the same time the drops that fall to the floor, solidifying one at a time, build up a slender pyramid beneath,—a stalagmite,—which reaches higher and higher as its stalactite hangs lower and lower. In time these two formations meet in a slender pillar, the pillar thickens through the same slow process and if the pillars stand close enough together,—as where the drip follows a long rock fissure,—the pillars will eventually join in a solid partition.

This *dripstone,* as the material of the formation is termed, began as soft carbonate of lime; it hardens into *gypsum* or, sometimes, alabaster, or calcite.

The boy peered once more into the carved gallery, waiting till an up-flare of the dying fire again illumined the fantastic ceiling, whose fairy architecture gleamed opalescent in the

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orange glow. He thought of the old fairy tales of gnomes hammering on their golden anvils in their jeweled caves in the hearts of the mountains, and wondered if such lore had not arisen from the fact of just such cave formations, coupled with the echoes the slightest sound set to reverberating. After all, most folk tales had some foundation.

Once these Mexicans were captured and the forest fire brought under control, he meant to ask Norris if their camping expedition might not include an exploration of some of the caves he had assured them honeycombed this part of the Sierra.

He little dreamed in what fantastic fashion his wish was to come about, as he lay there waiting till he could start his ride for help!

Nor did Pedro, drowsing, exhausted, beside him, dream of the test that was to be made of his courage while he remained behind. He seemed so fagged that Ted did not even wake him, when at last he deemed it time to sally forth.

Ted loved nothing better than a good horse.

The plainsman, he used to argue, may have his twin six, the airman his ship, but for the

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outdoor man, give him the comrade who can take the mountain trails, the needle carpeted forest floor, the unbridged streams, the glacier polished slopes.

The black horse wore the high Visalia saddle, against which his rider could rest on steep grades. It would be more dangerous, should the animal throw him, though of course the high horn would help him to pull leather should need arise. He had lengthened the stirrups, Western fashion, till his long legs dangled easily and he could have raised himself scarce an inch above the saddle by standing in his stirrups. His long, lean legs would give him a good hold where the going was rough, and if he had only a quirt, or even a pair of drop-shank spurs, he would have felt confident of making time. (For he knew how to use the spurs so that they would not torture his animal.) He regretted that the mysterious owner had not fitted the poor brute with the old spade bit, for should the horse fall, on the uneven ground, it would be likely to cut his mouth badly. He had once seen an animal bleed to death from such a hurt.—Well, they must not fall!

Mechanically he opened the reins, as was his

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habit:—His own horse had been trained to hitch to the ground, and all he had to do when he dismounted in a hurry was to drop rein. He was glad to find that the saddle was rim fire, (or double-rigged,) as it would stay in place, no matter what acrobatics they might be forced to perform.—So far, so good!

With right hand on the saddle horn, left grasping rein and mane, he swung up, and before ever he touched leather, they were off.

Would his mount prove broncho? Had his probably Mexican owner uglied his disposition? That remained to be discovered. And on that detail would depend much of the success of his race for help. For with Norris at the far end of the ridge, there would be several hours of tough going, he surmised.

"Yes, sir, you shore gotta *slope* some!" he told the mustang, in imitation of the cow-men. "Or those Greasers will just naturally fade out of the landscape."

As the night wind blew the smoke down canyon, he could very nearly tell his way, and the time as well, by the stars. Being early in July, he knew that in the constellation of Hercules, almost directly above, the hero's head pointed

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South. It was something Norris had told them one night when they had to travel late to find a fit camping spot. The crest of the ridge lay South, and along the crest he should find more open going. He would then have to veer to the West. As Venus rose brilliantly in the East, he knew he had now about two hours and a half till sunrise.

Breasting the wind, he headed around the twisting stems of unyielding manzanita, then up, straight South, over slide rock and fallen tree trunks, turning aside for only the larger bowlders. The mountain-bred horse was lithe as a greyhound, as he alternately climbed and slid, or made wide leaps over the uneven slope.

The ridge attained, however, he found it harder going than he had imagined, by reason of the broken shale, weathered by the frost of unnumbered winters. But just on the other side,—that furthest from the fire zone,—stretched a smooth granite slope, where the going would be unobstructed. But these smooth slopes, bed of that prehistoric river of ice, slanted slowly but surely to the cascading mountain stream whose roar now assailed his ears. One slip on that smooth surface and his horse

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would never stop till he had reached the rapids! The boy wondered if the animal were sufficiently sure-footed. The answer would mean, at the very least, the difference between a broken leg and a sound one, for the boy speeding to secure help in the capture of the fire bugs. But there seemed a fighting chance, and he would take it.

At intervals the granite was blocked out by cracks, and he found the slight unevenness of a crack lent his mount a surer footing. At times it was fairly level and he ventured a gallop; again it was precarious even at a walk.

Suddenly a monotonous "chick-chick-chick" buzzed beneath their feet. The horse leapt violently to one side,—just in time to evade the coiled spring of four feet of green-black rattlesnake, on whose sinister form he had all but trod. By that instant leap he had avoided the speedy death of the injected virus of the stroke. Ted's heart was in his mouth.

On—on—on he urged the black. It became mechanical; he ceased to think. Exhausted alike by his long vigil and the strain he had been under, he now sat his horse in a daze, just keeping his nose generally Westward, while he skirted the crest of the ridge. He felt half

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numb as he rounded the end of the crest where Norris was to have been stationed.—To his stupefaction, the fire fighters had completed their trench and gone!

Where could they be? Probably back at the camp, which he had skirted by this detour, never dreaming he would find any one but Rosa there. Well,—he was "outa luck!" Back he went the way he had come, till he thought it time to climb the ridge. A flare of cook-fire through the graying dawn showed him where to head, and the huge sun was just slipping blood-red through the smoke gloom as he took the last log at a leap and dropped off beside the moving figures.

The men were all there,—as was Ranger Radcliffe, whom the DeHaviland had evidently returned with fresh supplies. It took but few words to acquaint them with the situation.

By the time Ted had drank a quart of coffee with his breakfast, he was able to pull himself together again and lead the possé to the hidden cave mouth. The Ranger would have to be the one to go, to make the arrest, and he deputized Ace to help him. That meant leaving Norris to head the firemen. (It never occurred to any of

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them that they would not be right back with Pedro and the Mexicans. The foam-flecked horse Ted left to Rosa's care.)

The cave mouth accomplished, Radcliffe entered first, with revolver cocked, though Ace almost trod on his heels. Ted staggered after with a flaming pine knot flickering in his almost nerveless hand.

The cavern was absolutely empty!

To Pedro, left in the cave mouth to watch the Mexicans, the night had been the crucial test.

He had been asleep when Ted departed, while the Mexicans had slept within the cave. He awoke to find the three dark visages bending over him, their verbal fireworks hissing about his ears. At first "caballo" was all he could make of it,—(the horse.) Then as Sanchez the stout, soared rhetorically above the others, he gathered that they dared not leave him and they could not carry him. "El Diablo!" How much simpler to thrust a dagger between his ribs. "Muerte!—Presto!" But no, wait! For the time being he would walk between them carrying two extra torches. There must be another exit to the cave, but could the burros make

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it with the packs? Try it they must, for this way their choice lay between the fire fighters and the flames. The doomed forest still glowed red and black down canyon, and with the morning light, the wind veered till the smoke assailed them chokingly. There was no time to be lost.

Never for an instant dreaming that Pedro understood, they gave him the torches he was to bear, and started into the depths of the cavern. —And the boy? Too frightened at first to have spoken had he tried to, he had the wit to see that protest would be useless. They were three to one, armed, and desperate, and they counted him a likely witness to their incendiarism.

Besides, now that the wind had changed, he could not have gone ten paces without having been blinded by the smoke till he could not see where he was heading. This side of the canyon was going to go like tinder, too. Besides,—this came later,—how could he allow the fire bugs to get away? His job was to keep tabs on them, and that he would now have an exceptional opportunity to do, he cheered himself.

At first the flare of the torches revealed merely the cavern of onyx stalactites he had

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seen the night before. This formation wound in a narrowing labyrinth until they made a sharp turn to the left. Presently they came to a pit of inky water, around which they had to skirt on a sloping shelf. The burros could not make it and they left them there. Either, Pedro argued, they meant to return that way or else they had other supplies awaiting them.— But now they could no longer smell the smoke. From somewhere came pure air, damp and refreshingly chilly. The sounds of the outer world were cut off completely. On and on they wandered as in a dream. Pedro began surreptitiously pinching himself to make sure he was not having some weird nightmare.

They came to a grotto that might have been brown marble, whose curious carvings he had no time to study. From this they had to crawl on hands and knees through an opening into another twisting passageway, floored with muddy water and barely high enough for them to stand erect. Their voices echoed and reechoed. Then came arches of stalactites almost meeting the stalagmites beneath them, through which they edged their way as through a frozen forest.

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This opened into a vast cavern hung as with icicles of alabaster, which their torch light warmed to onyx.

"If these fellows weren't so free with their knives," Pedro told himself, "it would be an adventure worth having. But they certainly have too much dynamite in their dispositions to suit me,"—for the Mexicans were now quarreling among themselves. The boy and the old man were for turning back before they lost themselves,—for at every turn there were branching ways.

But Sanchez, the heavy-handed, was for going on,—and on they went, shivering in the unaccustomed chill.

Pedro wondered what the rescue party would do when they found them gone. If only he could leave some sign of his whereabouts! Could he drop his handkerchief at one turning of the ways, his hat at another, without detection? Or was it already too late? Why had he not thought of that before?—Tucking one torch into the crook of the other elbow for a moment, he dropped his bandanna as again they took the left-hand of two turns.

But now their little flare of light revealed a

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blind passageway. The water-worn rock had been hollowed out by some eddying pool, no doubt, while the main stream had flown on past. —How he wished he knew more of cave formations! Should he find opportunity to escape, how would he ever find his way out again?

Retracing their steps, they took the right hand turn. Here was another high roofed vault,—he could not see how high, he could only guess from the reverberation of their voices,—whose stalactites had become great pillars that gleamed yellowly. The floor sloped toward them till they had stiff climbing. On one wall was a limestone formation like a frozen cataract. And thrust into the wall beside it he saw a torch stick. Who had left it there, and what ages ago, he wondered? In this cavern some of the stalactites hung as huge as tree trunks, and had not Sanchez bade the others keep an extra eye on him, the lad might easily have hid behind one.

Some of these huge pillars were cracked with age, and again the thought occurred to him that if only he might insert himself into one of the cracks,—a few were all of a foot in width,—he could easily escape detection in that uncer-

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tain light. But now he was under surveillance every instant. Besides, (tardy thought,) was he not pledged to keep an eye on the villains? He smiled through his fears at the recollection that they, not he, were captive.

Meantime Ace and Radcliffe, (leaving Ted to sleep off his exhaustion in the cave mouth), were examining the onyx cavern and the ground outside for some sign as to what had happened, and which way Pedro and the Mexicans had gone. Radcliffe had his electric flash, and at the turn of the winding passageway discovered scratches on the sandstone floor where the burros had left hoof marks. But had they taken the turn to the right or that to the left? There were hoof prints both going and coming, in each passageway. Which had been made the more recently? They could not tell.

Ace hoped that the Ranger would propose each following a different direction, but instead, Radcliffe remarked that they ought to have brought a ball of twine to unwind as they went, as people had been known to get lost in unknown caves, and stay lost for days. The best alternative was to make a rough map of their turnings in his note-book.

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They advanced along the right hand passage-way, whose breath seemed like that of another world from that of the parched mountain side, —cool and moist and wonderfully exhilarating. Had it not been for his uneasiness as to Pedro's whereabouts, Ace would have enjoyed this expedition into the unexplored. His was a nature that craved the tang of adventure, even more than most. It was one of the things that had led him to take up geology, for in the U. S. Geological Survey his life would lead him, likely, to far places.

He wished, though, that Ted were with them. A good pal certainly doubles one's enjoyments.

They had gone what seemed like miles, (though cave miles are deceptive, so completely is one cut off from space and time,) bearing always to the right, when Radcliffe's light suddenly burned out, leaving them in primeval darkness. At first breath they tried to laugh at their predicament, then the utter blackness seemed to press upon them till it suffocated, and Ace suppressed a sudden desire to scream. His panic moment was dissipated by Radcliffe's discovery of a bit of candle. Ace had, of course, that most important part of a camper's

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equipment, a waterproof match-box, linked to his belt, and in it a few matches. But even then it meant going back the way they had come, for without a good light they could do nothing. Perhaps it was just as well, for they were bound on no hour's adventure, and should have brought food as well. How Radcliffe wished he had his acetylene lamp!

To their surprise they found Norris at the cave mouth trying to arrange his coat under the sleeping Ted. And around him lay the coiled lariat he had taken from the saddle-horn of Ted's recent mount, also three canteens, some cooked food, and a supply of hard candles from the fire crew supplies. There were also the boys' sweaters,—Radcliffe, of course, had his woolen uniform,—and to cap the climax, a ball of twine and the Ranger's pet lamp, with its tin of carbide powder.

To their amazed query Norris explained that he had explored dozens of caves in his time, including some hundreds of miles of that honeycomb formation that underlies a portion of Kentucky, to say nothing of the caverns of the Shenandoah Valley of Virginia, the Black Hills of South Dakota, and the Ozarks. Of the caves

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of California, however, he as yet knew nothing.

Had he not been needed to head the fire crew, he would have loved nothing better than to have gone with them.

"I knew this was a cave region," he told them as they ate and refreshed themselves before going back into the black depths—for they had been gone several hours, it seemed. "Fissured limestone—I noticed it yesterday when we were down here trying to backfire. Then what feeds the Kawa? Not these little flood creeks that dry up almost before the spring floods are over. Where does all that snow water go to? Some underground passageway, of course. It seeps through the porous rock to subterranean channels.—By the way, I see there are tracks of muddy feet inside here, and *your* feet are dry! The mud must have been left by the Mexicans."

"That's a fact!" exclaimed Radcliffe. "Ace, did you notice any mud along that passageway? Then we surely took the wrong turn."

"Not necessarily," said Norris. "They might have *come* from some muddy cavern, but gone back another way. However, I was going to give you a little idea of the probable layout of a cave. This one, if—as I suspect—

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it feeds the Kawa—likely descends to other levels, till the lowest one is very nearly on that of the river. Seeping through, here and there, the rains and melting snows probably collect into a stream."

"Wish you could go with us, old chap," said the Ranger. "But——"

"You'll get along all right, with these things," sighed Norris, "and if you don't show up again within a few hours, we'll follow your twine," and he tied one end of the cord ball to a manzanita bush, handing the ball to Ace. At that moment Ted awoke and insisted that he join them. Norris reluctantly returned to the fire crew.

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CHAPTER VII

THE CAVE

ELECTING the turn to the left, Radcliffe led the way with his carbide lamp. Ace and Ted followed with their candles.

This time their choice was quickly verified by the discovery of the burros, standing patiently with their packs before the pool. (That accounted for the muddy footprints.) Skirting this on the shelving ledge as had Pedro and the Mexicans, they traversed the winding passageway that led to the grotto of brown cauliflower-like encrustations. But here, when they found that the left-hand passageway meant going on hands and knees, they chose the other turn. (They came that near to catching up with the fugitives!)

With the suddenness of events in a dream, they came into a vast chamber that at first

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glimpse, lighted as it was by the carbide lamp, gave the impression of a baronial ruin. The boys whistled simultaneously under their breath. At the far end stood a huge stone elephant,—or so it appeared at the first startled glance,—and beside him a gnome and several weird beasts vaguely reminiscent of the monsters of prehistoric times.

When Ted could speak, he whispered, "What are they? Fossils?"

Ace laughed. "I should say not. They're nothing but dripstone, can't you see?—They'd be 'some fossils'! Why, if we could find just one fossil as big as that, our fortunes would be made—absolutely."

"Gee! Then I'm sure going to keep my eyes peeled."

"I thought," put in Radcliffe, "that fossils were little stone worms. I've found those aplenty."

"Fossils," explained Ace, (fresh from first-year geology,) "are any remains of plants or animals that lived, either on land or in the sea, in ancient times. A lot of those we find to-day were shell-fish and other marine life."

"Gee!" grinned Ted, "doesn't he talk like a

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professor? I'm going to call you professor after this, old Scout!"

"Go on," the Ranger urged, ignoring this sally, "I'm interested."

"So am I, honestly," amended Ted contritely.

"There were land animals, too, that got buried in the accumulating sediments and fossilized. Times when the ocean over-ran the land, they got drifted into it, and sank, and got buried under the sands that made our sandstones——"

"This floor is sandstone!" interpolated Ted.

"Yes. Or they got buried in the ground-up shells that made our limestone,—like the walls of the cave,—or some of them were buried in mud."

"I suppose," offered Ted facetiously, "that the mud made mudstones," and he laughed till his voice echoed and reëchoed startlingly.

"Ha, ha! You're right!" Ace turned the laugh on him. "Go to the head of the class. I'll show you mudstone when we come to it."

"Why, then," ventured the Ranger, "this must be a topping place to find fossils."

"Provided," Ace admitted, "the cave is not

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of too recent formation. But as I was about to say," (seeing their undoubted interest,) "geologists can just about piece together the history of the earth from the fossils that have been found, but no one locality gives it all. They have found part of the story in America and part in Africa, and parts in Europe and Asia. And from that series of fossils—and some other evidence—scientists have about agreed that since the earth was formed, about twenty whole mountain ranges, one after another, must have been formed and worn away almost to sea level."

"How do they make that out?" Ted looked skeptical.

"That's another long story.—I'm no professor.—But——"

"You can't prove it."

"Neither can you disprove it, any more than you can the conclusions on which astronomy, higher mathematics, any of the sciences—are based."

"I suppose so! Gee, I'd like to study those things for myself!" sighed Ted, seating himself beside the others on a dry ledge while they ate their sandwiches.

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"Find a valuable fossil and you've earned a college education," Ace challenged him. "And you know, fossils are not necessarily fish or insects or skeletons or tree trunks that have been turned to stone."

"To stone?"

"By the removal of their own tissues and replacement by mineral matter. A fossil may be merely the print of a leaf of some prehistoric plant on sandstone, or the footprint of some antediluvian reptile. In the National Museum they have a cast of a prehistoric shad that shows the imprint of every bone and fin ray."

"How on earth could that have been formed?" marveled Ted.

"Why, it was simply buried in fine mud, which first protects it from the air, (and consequent immediate decay,) then gradually fills every pore of every bone, till by the time the mud has turned to stone, the bones are ossified. Of course the animal matter has all dissolved away by this time. Now if this mud that filled the pores happened to be silica, (a sandy formation,) it is possible to eat the surrounding limestone away with acids and uncover the silica formation, see, old kid?"

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"Aw, that stuff makes my head ache," protested Tim. "If I see any ossified bones lying around, or even a footprint or leaf print in the stone, I'll know I've found a fossil. But I thought we were chasing fire-bugs."

"The impatience of youth!" Ace playfully squelched him, from the vantage point of his slight seniority.

"What does the Bible say," laughed the Ranger, "about truth from the mouths of babes?" And he arose a bit stiffly,—for he had had a strenuous time of it the past few days, and the cave damp had set his tired limbs to aching.

For upwards of an hour they followed dark and winding passageways, (rats and lizards and occasional colonies of bats fleeing before them,) naturally without the slightest sign of the fugitives, when they came to another grotto, the loveliest they had yet seen. It might have been a fairy-cavern, aglitter with pure crystal. The carved prisms shone dazzlingly in the light of the carbide lamp, and the boys stuffed their pockets with some of the jewel-like bits that had fallen to the floor.

From this they presently entered into what

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seemed like a Gothic cathedral, with a dome whose highest point must have been several hundred feet above. The boys were fairly awed by its beauty, while the Ranger's eyes gleamed appreciatively. On the walls were what might have been carvings of flowers and lacework, creamy to smoke color, gypsum, Ace told them.

"Are these fossils?" demanded Ted excitedly.

"I should say not, you poor fish!—You ichthyosaurus," laughed Ace teasingly.

"You what?" asked the Ranger.

"That means ancient fish."

"All right," grinned Ted. "If I'm an ich——"

"Ich-thy-o-saur-us?" Radcliffe came to his rescue.

"Then you're a dinosaur," grinned Ted.

"Here, here, stop calling each other names!" commanded Radcliffe. "And perhaps Ace will tell us about this gypsum formation."

"Thunder! Wish Norris was here! I tell you I'm no professor.—But if you're after fossils, don't you remember what he told us, that day just before we lost the pack burro?—That in this part of California we have rock from

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the Cambrian era a mile thick, and I'll bet it's full of fossils of the fish age!"

"Well," Radcliffe briskly interposed, as they came to another turn, "we'll never find those Mexicans unless we separate and hunt faster than we've been doing. Are you fellows game for taking one way while I go back to that last turn and try the left hand passageway? Of course the instant you get wind of them, report back to me." They signified their gameness by picking a precarious footing, (Ted first,) along the slippery floor, their candles thrust in their hat bands.

Above they came to another but a smaller forest of alabaster stalactites, shining like icicles or mosses, some white as snow, some yellow as gold, and some so like maple sugar in appearance that Ace actually tasted it. In one place there was a bit of what Ace said was needle gypsum, that hung as fine as fur.

Radcliffe, retracing his steps, (with the aid of the twine ball,) till he came to the cross roads, as it were, turned to the left and forged ahead with his carbide lamp, treading softly as a cougar, with revolver cocked in his right hand. Ever and anon he stopped breath-still to listen.

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Passing through the same alabaster cavern that had so impressed the Spanish boy, his eye caught the bandanna Pedro had dropped in the left-hand passageway. With an inward exclamation, he hurried on till he had reached the end of the blind. Stooping with his lamp, he could see the fresh scratches their feet had made. Darting back to the turn of the tunnel, where he had picked up the bandanna, he took the only choice left to him, the right hand way, with all the satisfaction of a hound on the scent. More scratches on the sandstone floor assured him that they had really gone this way, instead of turning back the way they had come, and presently he too was standing in the gallery of the sloping floor and yellowed pillars, at whose far end the dripstone cataract hung, turned to soundless stone. But of the three Mexicans and Pedro there was no trace.

"I say, when do we eat?" Ace was just beginning, when the floor suddenly gave way beneath him, and he fell down a ten foot well, landing on all fours, in Stygian blackness. And no sooner had his bulk padded the stone beneath than Ted came, plunk! almost on top of him.

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At the moment both were slightly stunned. Their candle flames had of course been flicked out. Then Ted reached mechanically for his matches, by whose flare he found his hat, and still firmly stuffed into the band, his candles. The light disclosed a cavern with muddy walls dripping above them, and to their right, an inky pool of water. The air was all aflutter with the bats they had startled from their pendant slumbers, lizards scuttled away in all directions, and a fish flopped in the pool, with a splash that sounded out of all proportion to its exciting cause. Ted grinned as he saw Ace first pinch himself to see if he were dreaming, then slowly feel his joints to make sure none were seriously damaged.

The fall had rather jolted his nerves, but otherwise he was unhurt, as was his chum. But how to return the way they had come they could not see, for the walls were too slippery to climb, there was not a spear of anything movable in sight on which they might gain a foot-hold, and when Ted tried it from Ace's shoulders, the rim of the well was too slippery with mud for him to gain a hand-hold.

The bats, blind from their lightless lives,

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bumped against them and added the final touch of weirdness by their gnome-like faces.

With the uncanny feeling that they ought to whisper, the shaking boys started to explore the cavern, which they found led off in three directions. It must be on the same level they had left when they said good-by to Radcliffe, but in their panic they were completely turned around, and they had not explored for ten minutes before they were so confused that they could not even have found their way back to the cavern of the pool.

Now Ted had been lost before. He knew the panic feeling, the sudden sense of utter and helpless isolation, the absurd fearfulness, almost the temporary insanity of it. His scalp prickled,—as did Ace's,—and for a little while his wits seemed befogged. Then he remembered that bed-rock advice Long Lester had once given him. When you don't know which way to go, sit down and don't move one step for half an hour. And try to think out the way you got there, or some plan of campaign for finding yourself again.

Ted had once been lost in the chaparral,—a

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thorny tangle of low growths that reached higher than his head. When he first discovered he was off the trail, he wandered about as in a mystic maze, till a shred of his own gingham shirt, (caught on a stub of manzanita,) told him he had circled.

He had had to spend the night there, but in the end he had stumbled upon the trail again, not ten feet from where he lost it.

As Long Lester afterwards pointed out, had he but blazed his trail from the very first step, he could at least have back-tracked. Or better, if he had with his jack-knife made a blaze sufficiently high on some stunted tree to have seen it and come back to it, he might have circled, and in ever widening circles would surely, in time, have found the trail.

Or, again, he might have—had he known—at least hacked a straight course by the stars, (always provided that he knew in which direction lay the way out.)

"Ace," he managed to steady his voice when they had been seated on a dry ledge for some little time, "your knowledge of cave formations might help us to find the way out of here.

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Gee! If this was only in the woods, or even on some mountain side above the clouds! But it's up to you now."

"Well," Ace began, "the map of the typical cave, say like Mammoth, wiggles around a little like a river with its tributaries, though nothing like so regularly, with here and there a wider place, and——"

"Here and there," contributed his chum, "a well to a lower level."

"Yes. You see, the water that wears a cave out of the softer layers of rock seeps in along the fissures of the surface rock, and at first they make subterranean rivers. Where you find these big springs in the hillsides, they may be the outlets of these underground waterways."

"I get that, all right," said Ted.

"Well, then, sometimes these Stygian streams——"

"Keep it up, Professor!" Ted clapped him on the shoulder.

"Huh!—These rivers wear away the soft limestone layer,—if it is this kind of a cave,—till they come to the harder sandstone. Then the first chance they find to get through the sandstone,—perhaps through a crack made by

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an earthquake or something,—they go down and wear away a deeper level. Mammoth Cave is on five levels. That leaves the upper galleries dry. Now the one we were on was dry except for the moisture that is always seeping into a cave, but I suspect now we're on a level with the river, it's so muddy, and we'll find it somewhere."

"Then we'll find it somewhere!" brightened Ted. "And we can follow it. That's the plan of action!" and he jumped to his feet.

"We'll follow it if we can. Thunder! I wish we had a boat."

"So long as you're wishing, why don't you wish for a fat steak with onions?"

"It has been some time since we ate." Ace tightened his belt. "Must be getting late in the day! Let's run!" And run they did, till they began slipping on a muddy slope.

They had to place each foot with care now, and their progress was slow. At the same time their candles were nearly gone. "Now let's put out all but one," suggested Ted. "Just burn one at a time. What *would* we do without any light?" But Ace did not know the answer.

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What of Pedro, meantime? At that particular instant he had just tried to make his getaway, with the result that three drawn daggers were being flourished threateningly and most unhealthily near his heart. He had overheard enough evidence to convict all three of the Mexicans, thanks to his knowledge of the parent language, but as the desperadoes pushed farther and farther into the labyrinth, he gathered that they would come out a good safe distance from where they had entered,—probably on the other side of the ridge. Had he known the Ranger's whereabouts at that precise moment, he would have felt very differently.

Radcliffe, meantime, was staring into the dark recess of the cavern, but all he could see was the two shining eyes of whatever occupant was there. Was it bear or cougar? For both, he knew, took refuge in caves. The largeness of the eyes inclined him to the belief that it was a California mountain lion, and such it was part of his work to exterminate,—though the state also hires an official lion hunter.

That the great cats are cowards he well knew. But this one was cornered, and might prove no mean antagonist. With revolver cocked in

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his right hand, his lamp in the other, he advanced toward those two shining fires. A faint scratching along the rocky floor warned him that the animal was gathering for a spring. He was still rather far for a revolver shot, but he aimed straight between the eyes.—His shot reverberated with a thousand echoes. The sounds, ear-splitting in the smoke-filled gloom, —thundered like a thousand siege guns, it seemed to Radcliffe, stalactites tumbled about his ears like crockery, and more appalling than all the rest was the weird, almost human scream of the wounded animal, which likewise reëchoed for several minutes. The unwitting cause of all this turmoil was in a cold perspiration when things finally quieted down. But the puma, (for such it proved to be,) lay dead at his feet.

The three Mexicans likewise heard the racket, for they, as it happened, were not far away. The Ranger had very nearly trailed them. With rolling eyes and hands that mechanically traced the sign of the cross, they listened, while the thunders died away.

Pedro, though his nerves were more than a little shaken, was quick to seize his opportunity. Slipping like an eel through a narrow opening

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between two columns, where the dripstone had all but closed the way into another chamber, he would have escaped observation entirely had it not been for his betraying torch-light.

Sanchez darted after him.—But remember, Sanchez was at least a hundred pounds heavier than even well-fed Pedro. The result might have been expected. He stuck mid-way! And there he dangled his fat legs in an endeavor to free himself, while Pedro doubled with laughter and the other Mexicans stared, too amazed to move.

"Pull, can't you, pull!" was Pedro's expurgated version of Sanchez's reiterated discourse with his followers. And when no one came to his rescue, he nearly burst a blood vessel in his helpless wrath.

Pedro, feeling safe from pursuit, with such a plug in the only approach to his sanctuary, now for the first time disclosed his knowledge of Mexican. Sanchez's astonishment was as huge as his attitude was undignified, and if words could have seared, Pedro would have been well scorched. But the boy only told him of an item he had read in the paper, where a fat man got stuck in a cave and had to fast for three days

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before his girth had diminished sufficiently that he could be extricated.

With that, Pedro bade them a fond farewell, and departed along a labyrinthian way they could not follow. That some one was on their trail he suspected from the revolver shot, and the fire bugs would be nicely trapped.

Now the Ranger reasoned that the lion's den would not be far from the outer world, and in that he was right, as he proved by following it to its end. The last lap of the way he had to wriggle along on hands and knees, but he could see the glow of the setting sun in a circle of light at the end, and in a very few minutes he had poked his head and shoulders beneath an overhanging bowlder on a rock ledge. It was the Southern slope of the spur, and after a little reconnoitering he discovered that it was the selfsame spur on which fire-fighting headquarters had been established. The cave, then, pierced clear through the ridge, and he had been exactly all day in following its windings.

Hiking wearily up the slope to the ridge, he could see the glow of the cook-fire perhaps a mile away, while down in the canyon on the other side the fire still glowed in red embers

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where it continued to devour the blackened tree trunks, though it was under far better control than it had been the day before.

Rosa's solicitude at his haggard face and tattered, mud stained clothing restored him wonderfully. (After all, there were compensations in the scheme of things.)

"We were just about to start a search party in there," said Norris. "I would have before, if it hadn't been for the fire.—But where are the boys?" He paled in alarm.

"I don't know," Radcliffe dragged from white lips.

"Oh!" gasped Rosa, her eyes filling with tears which she promptly hid by turning her back.

Without a word Long Lester gathered up the paraphernalia the Ranger now saw he had stacked and ready on the ground, and fitted it into a back-pack. There was food, rope, and candles, another tube of carbide for Radcliffe's lamp, a box of matches in a tight lidded tin, and even a short length of rustic ladder made for the occasion.

Norris shouldered part of it as by previous agreement.

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Radcliffe explained the diagram he tore from his note-book, marking a black cross at the point where he had left the boys.

"I dunno," said the old prospector, "but what we might as well go in one way as another. I reckon we can folly this yere map backwards as well as forrud, and we'll just hike down and go in the way you kem out."

"That's a go," agreed Norris, striding after him.

"Oh," yelled the Ranger after them. "Come back! I'll deputize you both. Here, Norris," and he gave the younger man his revolver and cartridge belt, with his official pronouncement.

"I swan!" said Long Lester. "Here I were a-thinkin' so much about them boys I clean forgot the Mexicans," and he slung his rifle atop his pack.

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CHAPTER VIII

THE SNOW-SLIDE

"I'M glad they got in a few hours' sleep this noon," solicitized Rosa, placing home-made bread and coffee before the Ranger, then dipping up a bowl of soup. She looked fagged to death herself, and Radcliffe made her promise to roll up in a blanket on browse bed.

"Oh, if only it would rain!" she sighed, "and put out the fire!"

"Sure wish it would!" he agreed. "Haven't had such a big one in years."

"The DeHaviland was back with more supplies," one of the men reported.

"It sure takes tons of grub to keep these firemen stoked," sighed Rosa drowsily from her blankets. "But they work like lumbermen, and I'd give every last man here a medal if I could."

Norris and Long Lester skirted the South slope its whole length without finding the cave

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mouth from which Norris had exited. But by now it was dark, and task doubly difficult. "If it wasn't for them boys being most likely just plumb panicky from being lost," said the old man, "I'd call it sense to camp for the night. Once it's sun-up, we'll find the place easy enough."

But Norris was too uneasy to leave any stone unturned. What might not have happened in the hours since he had last seen his charges! His imagination, given free rein, pictured everything from murder to raving mania.

As they neared the head of the gulch, they could see, on the side of the main ridge that towered above them, patches of snow that gleamed white in the star-light. The canyon here headed sharply to the left.

The side they were on, the short side of the turn, was becoming impassable with rough bowlders and tangling underbrush.

Of a sudden a low rumbling sounded faintly from seemingly beneath their feet. The ground wavered dizzily. Trees swayed, rocks started rolling down the canyon side, and the very bowlder they were on tilted till they had to make a quick leap for it.—It was just one of the slight

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earthquake shocks to which all Californians are accustomed. But never before had either Norris or Long Lester been on such dangerous footing when one happened.

Quick as thought, the old man went leaping up over the bowlders, yelling frantically to Norris to follow him. The geologist knew in a theoretical way what to do when a snow-slide threatened, and with that lightning speed with which our minds work in an emergency he had seen that the shock of the 'quake would precipitate snow-slides, and that they were directly in the path of one.

He knew theoretically,—as the old prospector knew from observation of several tragedies,—that the river of snow and rock-slide would flood down canyon till it came to a turn, then hurtle off in fine spray—on the side of the curve! (It all happened in an instant.) Their one salvation lay in taking the *short* side of the curve,—though the going was rougher.

With the roar of an express train,—whose speed it emulated,—the oncoming slide tore down at them. Down 3,000 feet of canyon the crusted snows of what was still spring at that

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altitude rushed like a river at flood. The wind of its coming swayed tall trees.

The two men escaped by the skin of their teeth!

"It shore would'a scrambled us up somethin' turrible!" the old man kept exclaiming.

Next day, he knew, they would find a clean swath cut down the mountain-side,—tall pines swept away, root and branch. He had seen many of these scars, which in later years had become a garden of fire-weed and wild onion, a paradise for birds and squirrels and onion loving bears.

He had seen steep mountains fairly striped by the paths of slides, the forest still growing between stripes. For the steeper the slope, the swifter the slide, as might be expected.

Lucky for them this had been a Southwest slope; for on the North, away from the sun, a slide is even swifter!

He had seen one man buried by crossing the head of a slide which gave way under his foot. Its roar had been heard for miles. Frost-cracked from the solid granite, the side rock that accompanied it had been weathered from

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the peak. Thus are high mountains worn away.

For perhaps an hour after the near-catastrophe, the air was filled with blinding snow,—not that from the skies, but that of the snow dust raised by the slide.

The circle of the rising moon threw a silver glamor over the scene. "What do you figure makes these 'quakes, anyway?" asked Long Lester.

"The boys have asked that too, and I can't give it to you all in a breath. But I'll give you the story before we end this trip."

At the moment of the earthquake, Ace and Ted, immured on a lower level of the cave, were following a subterranean river. They got well splashed by the waves set up, and worse scared, but it was all over in a minute and they were only a degree more uncomfortably damp than they had been before. Suddenly Ted gave an exclamation. A crag of drip-rock had been shaken from the roof, and there, imbedded in the limestone, lay the plain foot-print of—it might have been a giant!

The boys stared, marveling a moment, then Ted voiced his guess. The fossil of some giant

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of prehistoric ages! "A fossil, all right," Ace agreed. "But that isn't a human footprint, even if there had been men that size. That was made by some animal! If we ever get out of here, let's bring Norris and come back with picks and find out."

"Then I can quarry this fossil out and sell it?" ventured Ted.

"Right-o!" with a congratulatory slap that made Ted wince.

But the inky stream had once more become placid, and skirting the muddy ledge alongside, they threaded their way through arches of varying height till finally the roof was so low that they had to go on hands and knees. Then the bank became so narrow that Ace slipped off into the unknown depths.—To his surprise, his feet touched bottom. Moreover, the water was not so cold as he had imagined. (It was about the same temperature as the air.)

"Come on in, the water's fine!" he encouraged Ted. "Do you know, we could swim this if we had to, and don't you think it must lead out?"

"Stands to reason. But how about our candles?"

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"Hold 'em in your teeth. Haven't you ever seen any one smoke a cigarette when he was in swimming? It's a stunt, but——"

"Ever tried it?"

"Sure. Have you?"

"No." And the deepening water soon proved that he could not keep his candle going. But Ace managed it for a few strokes. Then they had to swim in darkness. An increasing roar told them that they were nearing white water, possibly the outlet, and just as the current from a branch stream would have caught them, they felt an overhanging ledge and scrambled up on it, Ace lending a hand to his less proficient chum.

From the far end of the tunnel shone a faint glow, as through a sheet of water! They had reached a cave mouth.

Creeping cautiously along the ledge, they approached the light. From its pallor and from the roaring of the rapids they at first thought they were behind a waterfall. But a closer approach showed them that it shone through leaves of plants that grew just outside, where they over-arched the escaping stream. (Gooseberries, they later found, and other vines

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that completely hid the exit of the stream.)

It was a ticklish proposition getting out along the rock ledge, which narrowed to a mere rough crack into which they could dig the sides of their soles. But by holding hands and clinging with all their might, while they propitiated the law of gravity by leaning their weight against the wall, they slowly scaled a way above the churning stream, and so to where they could cling to the thorny bushes.

It was night. The light had been the moon shining straight into the cave mouth. But where they were, on what side of the ridge, they could not tell.

They were safe, though! Saved from the blind horror of being lost in the cave! But wet and chilled to the marrow now in the night wind that blew down canyon, famished, footwore, and aching for sleep.—Still how wonderfully fresh and perfumed everything smelled after the cave.

"Got any matches in your waterproof match box?" asked Ted with chattering teeth, throwing himself flat on the up side of a rock that would keep him from rolling. "Why, this is funny!" for there was no sign of the stream

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a few yards beyond the cave mouth. They were at the head of some former rock slide, and the stream simply disappeared, percolating underneath it to its destination, (wherever that might be.)

But an exclamation from Ace caused him to look in the direction of his pointing arm. In the canyon below them a bon-fire burst into bloom. "The folks?" cried Ace joyously.

"Maybe the Mexicans," Ted restrained him.

"Let's slip up on them and find out," urged the other. "Thunder! Wouldn't it be great if it was our bunch?"

"All the same, we gotta act just as if it was the Mexicans, till we know for sure."

"They've sure got a good fire," Ace shivered. "Let's hurry."

"All right, maybe it's Radcliffe come clear through the cave on a higher level, and maybe he's got the Mexicans."

"And Pedro?"

"And Pedro!"

"Sure, who else could it be?" they cheered each other.

But it was neither.

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CHAPTER IX

TED'S FOSSIL DINOSAUR

AN hour later two famished and exhausted boys were peering at the huge bon-fire by which Norris and Long Lester had decided to camp till dawn.

"Wal, durn yer hide, I'm that glad to see you I've a notion to wallop you," the old guide welcomed them. "But I'm not a-goin' to ask you a single word till you've et," and he proceeded to build up a brighter fire. "Peel off them duds, and roll up here in our blankets whilst we dry things for you."

The bedraggled boys allowed Norris to help them out of their heavy, water-soaked clothing, for their hike down the mountainside in the night wind had fairly stiffened their joints. First Long Lester administered a quart apiece of scalding tea, then insisted that, fagged as they were, they bathe their feet. "A camper is

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as good as his feet," and Pedro had yet to be located.

It was decided that, as they were all of them worn out, and Pedro, wherever he was, would likely sleep himself when night came, they would wait till dawn to search for him and the Mexicans. While it was a question as to whether they were still in the cave, it seemed best to search there first.

At the moment of the earthquake, Pedro had been crawling through a narrow passageway, bed of some former watercourse, whose walls dripped black in the glow of his dying torch. Then came a crash before him!—A chunk of rock had fallen from the roof into the passageway. When the alarming swaying motion and the thunder of the bowlder's fall had subsided, and he had relighted the torch, (which had been extinguished,) he found his forward progress effectually blocked. Behind were the Mexicans, —Sanchez possibly still plugging the opening into the passageway. He was a prisoner! He was entombed!

At first, utter panic possessed him. In like situation, those of weak nervous timber have

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been known to go insane. Then he got a grip on himself and reasoned that Norris and the rest would not leave him to his fate. They would never give him up till they had searched the cave thoroughly, and had he not left his bandanna at one turn, his handkerchief at another, and the end of a freshly charred torch at a third? Besides, (he smiled grimly,) if his own party did not find him, the Mexicans might. Or if they captured the Mexicans, they would wring from them a confession of his near whereabouts. (This time he laughed outright at thought of Sanchez the Stout still dangling his helpless legs when the Ranger found him. —The sound echoed and reëchoed weirdly.)

This experience had done much for Pedro's untried courage. For after all, is it not the unknown that terrifies us rather than the actual calamity to be faced? Another thing that helped the Spanish boy to be reasonably philosophical,—probably the biggest factor, after all, —was Nature's medicine, his extreme physical fatigue. Thrusting his hat through a narrow crevice so that it would be seen and recognized by any one coming that way, he stretched him-

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self out flat on his back on a bit of smooth, dry rock, thriftily extinguished the remaining bit of torch, and was instantly asleep.

He awoke, he knew not how much later,—but he felt refreshed,—to hear the sound of voices echoing and reëchoing faintly, far down the passageway. Fumbling frantically for a match, he yelled for help with all the power of his trained voice. (And the sound echoed back and forth.) At first Norris and the boys could not tell from which direction it came. Then Long Lester, who was in advance, saw the hat, and it but remained to remove the bowlder.

Now it was that they had use for their ingenuity, for their combined efforts did not suffice to budge the fallen rock. The cavern in which Pedro had become immured was off a lateral passageway leading,—if he had taken the turn to the right instead of the one to the left,—to the very cave mouth by which the rescue party had reëntered; for Long Lester had found, not far from the waterway through which the two boys had come,—but on a higher level,—some scratches on the rocks and a heel print in the scanty soil that told the old mountaineer as plain as words that that was the way

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Radcliffe had come.—Every heel in the party was different, one having Hungarian hob-nails set in a semi-circle, another a solid design in the same nails, a third the larger hobs, a fourth none. He knew the differences in size and the ones that were worn deeper on the inside of the foot. To him a footprint was as good as a signature, and better, for like an Indian, a "hill billy" can often read how fast you were going from a group of two or three foot-prints, how tired you were, and much besides. This knowledge had served them in good stead. He now hurried back to the cave mouth with Ace, found a down log that would serve as a lever, and they pried away the bowlder that kept Pedro a prisoner.

Sign of the Mexicans they could not find, save that Sanchez had been removed from the crevice of the stalactites, (at least he was no longer there,) but whether he had had to fast or not, they could not tell. The Mexicans evidently knew the cave and they had been near the southern end of it. Though Long Lester could find no trace of their footprints at either of the exits they knew, there were doubtless others, and it seemed the wisest course now to look for them

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outside.—For the boys were still unwilling to give up the chase.

Reporting back to Radcliffe, they learned, to their amazement, that the pack burros the Mexicans had left near the northern cave mouth had disappeared, but where, they could not tell from any sign left on the charred ground outside.

The Ranger would start a search for them in the DeHaviland, once the fire was under better control. The Forest Service finds its air service as useful in keeping track of law breakers as of fires. It would be an extraordinary thing if the careless camper should escape detection, for the air men can spy them out as easily as anything. But the fire still ate angrily through the timber, and would spread in all directions if left to itself. Fire fighting is sometimes a matter of weeks.

It was a dry summer, and all up and down the Sierras, the Rangers were kept busy fighting the fires that would break out from one cause or another. The Service 'planes were all busy.

The five campers were back at fire-fighting headquarters,—and Norris too,—when Ace had an idea. He and Ted would go in search of the

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Mexicans in his little Spanish 'plane. Would Radcliffe let them off the fire-fighting? He would, though he could not give official sanction to their plan. It was enough. The two boys were off before he could change his mind,—to Norris's slight uneasiness and Pedro's envy. (But Pedro was subject to altitude sickness.)

Sometime, Norris had promised Ted, they would go back into the cave and look for his fossil. But that could wait.

All that afternoon the two boys curveted over the surrounding scenery,—careful to keep their distance from the whirlwind of fire-heated air, for they were flying low. The most minute search failed to reveal the fire setters, but Ace only set his jaw the more determinedly.

They returned to sleep twelve hours at a stretch. Aviation is the best cure yet for insomnia, and neither Ace nor Ted had ever been troubled with that malady.—The next day they flew farther, carrying with them an emergency camp kit. They landed about every two hours, rested awhile, and finally went into camp about four in the afternoon, intending to take a look in the night to see if the fugitives would betray themselves by a bon-fire. They camped in a

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meadow where they had seen something like smoke arising. This proved to be steam from a hot spring, and they thought with longing how fine their chilled bones would feel in a good hot bath. But the spring water came too hot. (If they had had eggs, they could have cooked them in it.)

Then it occurred to them to dig a little trench, line it with stones, and carry the spring water by the folding canvas pailful to fill it. It would quickly cool to the right temperature. The scheme worked wonderfully.

The water had a strong mineral taste, not altogether agreeable, but its effect on aching bones was wonderful. A flint arrowhead buried in the soil they excavated told its tale of Indians, who must have valued the spring and fought for its possession against covetous tribes.

"What makes these hot springs, anyway?" asked Ted. "Have you had that yet in your geology?"

"Yes, but you'll understand better when Norris tells us the story he's promised about the formation of the earth.—I'm no professor." And he turned a former laugh on Ted. "Tell

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you what, Old Top, once we get these fire bugs located for our Uncle Sammy, what say we fly up and have a look at Lassen volcano before I send the 'plane back?"

"Bully! I'd like to fly over a glacier, too, and see what it looks like. Can you go that high?"

"I—guess so. Never tried it! We will, though!"

"Gee! Wouldn't this be a great way to teach geography—from an aeroplane!"

"Sure would!—Great way to go camping, too."

" 'S right, only—it would be if there was just the two of us," sighed Ted ungrammatically. "Could you carry enough grub?"

"We could get fresh supplies every few days, from some ranch."

The next day they went back for the rest of the party and showed them Ted's fossil, entering the cave the way Radcliffe had left it. Norris had spent one summer with fossil hunters in the dry gullies of the Southern end of California, he told them, where through scorching days and thirsty nights they had searched for any bit of bone that might lie amid the shale or

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imbedded in strata the edges of which might be seen on the face of a sun-baked bluff. The summer before, a group of geology men from a rival University had actually camped within a hundred yards of what was later discovered to be a deposit of rare fossils. It was therefore with heightened satisfaction that their reconnoissance had resulted in the discovery and excavation, bone by bone, of the complete skeleton of several most interesting prehistoric monsters that had lain all these ages embedded in the shale.

One bone four feet long, he told them, and weighing several hundred pounds, had been found in fragments in the shale, but it had been fitted together again, done up in plaster bandages and braced with splints, quite as a surgeon treats a broken leg. Another, found embedded in solid rock, had to be shipped in the rock, each piece being numbered as it was removed from the cliff as an aid to fitting it together again. Then with hammer and chisel the delicate feat of cutting away the rock and leaving the bone exposed was slowly and painstakingly accomplished. Thus have the bones buried before

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ever man trod the earth been made to tell their story. Often it takes more than a single specimen to reconstruct for the scientist the whole of the creature, but relics of fully thirty Triceratops have been discovered in different parts of the world, and where one skull has a broken nose, another shows it intact, and so on through its entire anatomy.

Its habits may in part be reasoned out, as for instance, if its hind legs are disproportionately long, it likely walked erect at least sometimes.

"That, as it happens, was not the case with Triceratops," he added. "There was only a slight difference between his fore and hind legs. Triceratops had teeth made for browsing, not for rending flesh; his single claw, round and blunt, does not indicate any pugnacious tendency on his part, and the solidity of his bones are found to-day in either a very sluggish animal or a partially aquatic one. The shape and rapid taper of the tail vertebræ indicates a rather short tail, round rather than flat,—ill adapted for swimming,—and so following through the list, till we have a Triceratops elephantine in general build, though more like a

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rhinoceros in face with a horn over his nose and two over his eyes, a horn-supported neck ruff, and a generally sluggish mode of life.

"In the coal fields complete imprints of Ichthyosauria have been found, doubtless due to the carbonization of the animal matter. And impressions have been left in stone of the very feathers worn by some of the now fossilized creatures."

It was by comparison of fossil remains that the well known evolution of the horse from a little fellow the size of a fox was learned. Ted often thought of that three-toed Miocene horse, and the giant monsters of his time,—of the upthrust of the Rocky Mountains, cutting off the moist sea breeze from the marshy country to the Eastward and making desert of it. This made life too hard for the heavy, slow-witted creatures, and they failed to survive the change. But the nimble footed little horse trotted long distances with ease, to find food and water.

Norris convulsed them by describing the creature on which he declared the aeroplane was modeled,—the pteranodon, that giant lizard, largest of flying creatures even in Mesozoic age, whose bat-like wings reached 20 feet from tip

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to tip,—as the fossil skeletons plainly prove.

This interesting specimen was a link in the chain between the birds of to-day and their ancestral archeopteryx, no larger than a crow whose front legs metamorphosed to short wings, whose skeletons have been found perfectly preserved in the limestone.

Ted was frantic for fear they would not find the place again, then could hardly wait to hear the Geological Survey man's pronouncement on his find. Norris chipped and chipped, with knife and hammer, till he had uncovered the impress of a great, membranous wing.

It was a fossil dinosaur,—a pterodactyl!

Ted's college education was secure!

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CHAPTER X

HOW THE EARTH WAS MADE

TED'S fossil would have to wait to be exhumed. In fact, Norris told him, he could sell it as it stood, and let the purchaser do the work. Then it occurred to him to wonder if Ted would not have first to take up a claim,—for it was Government land. Anyway, he would see to it that the boy was rewarded for his find.

The fire now being extinguished, Radcliffe had flown to other battle lines, first taking Rosa—as she insisted—back to her fire outlook. The plan was for the two boys to keep on hunting for the Mexicans, (as the harried Ranger now counted on their doing,) joining the rest of the camping party every night, at points they would agree upon. But first, Ace had made a flight to Fresno for supplies and to start his pilot home by train. He then carried them one

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at a time to where the burros had been left,—and where the lazy rascals still browsed on the rich mountain meadows.

For a day or two, all the boys could talk, think or dream about was the adventures they had just been through. But at last they had relieved their minds to some extent, and one evening around the fire, Norris gave them his long promised explanation of some of the natural wonders they had seen.

"I have already told you," began Norris, "how the earth probably originated. That much the astronomer has given us. And before the geologist can begin to interpret the evolution of our earth, he has to know what scientists have established in the fields of chemistry, mechanics and geodesy,—the study of the curvature and elevation of the earth's surface. He then proceeds to theorize, hand in hand with the paleontologist, or student of ancient life. The newest theory is in line with what I learned in 1917 at Yale."

"It's all theory, then?" asked Ted.

"Just as all sciences are, to some extent. Did I tell you that when our planetary system was disrupted from the sun, it was less than a

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hundredth part of the parent body? And our earth is a good deal less than a millionth of the size of our sun, and our sun is among the smaller of the stars of the firmament."

"Phew!" whistled Long Lester, round eyed, while Ted and Pedro sat motionless.

"Picture the earth and moon, revolving about the sun, gathering by force of their own gravity-pull the tiny planetesimals nearest them, these bodies hurling themselves into the earth mass at the rate of perhaps ten miles a second!——"

"It shore must have het things up some," said Long Lester.

"It did! Literally melted the rocks. On top of that, this original earth mass, composed of molten rock and gases and water vapor, was condensing. Probably by the time it had engulfed all the stray planetesimals it could, it was anywhere from 200 to 400 times as large as it is now. It has been shrinking ever since."

"Is it still shrinking?" gasped the old prospector.

"Sure thing! But not so fast that you will ever know the difference in *your* lifetime. It

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only shrinks at times; then the earth's surface wrinkles into mountain ranges."

"How many times has that been, sixteen?" suggested Ace.

"We'll come to that. As I was going to say, while the earth was so hot, it kept boiling, as it were, inside, and the molten matter kept breaking through the cold outer shell in volcanoes, as the heat rose to the surface."

"Thet sure must have been hell," laughed the old man.

"As the cold crust was churned into the hot interior, of course it melted and expanded, and that caused more volcanoes, and so on in a vicious circle, till finally, by the end of the Formative Era, so called, the rock that contained more heavy minerals sank to the lower levels, while the lighter ones rose as granite."

"Gee!" said Ted, "I'd have called granite heavy."

"Not so heavy as the specimens of basic rock we'll find. Well, in this Formative Era our atmosphere, and the hydrosphere or oceanic areas were being formed, along with the granite continents. But while we are on the subject, I hope you boys will some day see The Valley

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of Ten Thousand Smokes, in Alaska, where the earth is still boiling so close to the surface that you have to watch your step or you'll break through into——"

"The Hot Place?" laughed Pedro.

"Literally, yes."

"Oh, tell us about that!"

"Some time!—The interior of the earth is still hot, but the rock crust allows very little of it to rise to the surface.—After the Formative Era came the Archeozoic Era, when life began in the form of amœbas or some simple form of protoplasm. For with the formation of the gases of the earth mass into an envelope of air, to moderate the sun's warmth by day and retain some of it by night,—life became possible."

"But where did those first creatures come from?" Ted could not restrain himself from asking.

"According to one theory, the first germs of life flew here from some other planet, and not necessarily one of those revolving around our own sun, for space is full of suns and planetary systems. But that theory can neither be proved nor disproved. When I was a student, Osborn's theory was the latest.—That was in 1916.

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—Without going into it too deeply, it had to do with the electric energy of the chemical elements that compose protoplasm, and these always had been latent in the earth mass."

"Then they must have been latent in the sun, too," marveled Ted. "And in other suns and their planets too."

"Very likely," assented the Geological Survey man. "Now of course the ocean waters collected in the depressed areas over the heavier rock bottoms, the basalt. You remember just after we lost the burro we were on a basalt formation——"

"Then that was formerly a part of the ocean floor?" asked Ted.

"Either that or volcanic lava."

"But how did it——"

"Just a minute.—Of course land masses have gone down as well as up, but the general trend has been decidedly upward, while the trend of the ocean floor has been downward. At that, the shell of the earth—so to speak—is only about 150 miles thick or a fiftieth of the earth's present diameter."

"Then I should think the oceans would be growing deeper," ventured Pedro.

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"Right again. When this earth reaches its old age,—speaking in terms of centuries,—it will likely be all ocean. And there used to be far more land, in proportion, than there is now. There was less ocean water then because of all that is continually pouring through hot springs.

"Of course the land is slowly being washed back into the ocean. And the higher the mountains, the steeper the stream beds, and hence the faster the streams, and the faster they erode the high elevations, till finally all is reduced to sea level again."

"Then how do the mountains get rebuilt?" Pedro testified his interest.

"The earth has, as I think I said before, shrunk between 200 and 400 miles in diameter, —since the beginning,—'when the earth was unformed and void, and darkness was upon the face of the deep.' It is still shrinking. And this internal movement is felt on the surface in differences that generally amount to only a few hundred feet. I can show you places over there on the East wall of the Sierras where the mountains have been upthrust that way.

"Then, every now and again, the interior

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activities fairly break the rocky earth shell or lithosphere, and whole mountain ranges are raised. There have been at least eight such minor breaks in the earth crust in North America alone, and each time ranges perhaps a thousand miles long, or more, have been raised near one end of the continent or the other. In addition, there have been major re-adjustments that thrust whole continents higher and ocean beds lower. Geologists find evidence of at least six of these major breaks in the earth crust,—marking the beginnings of the Archeozoic Era, when *life* originated, the Proterozoic Era, or age of *invertebrates,* the Paleozoic Era or age of *fish* dominance, the Mesozoic Era or age of *reptile* dominance, the Cenozoic Era or age of *mammal* dominance, and the present Psychozoic Era or age of *man.*"

"Phew!" whistled Long Lester again. "Don't tell me this earth used to be all fish."

"It did, though. We'll go into that some other time.—I'll just finish about continent building now, and then we'll turn in.—At these times when the lands are at their highest and the oceans are smallest in breadth, (because greatest in depth,) the continents are united by

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land-bridges such as those we have now uniting North and South America."

"And Alaska and Asia?" suggested Ted.

"Practically, yes. And probably, at one time, South America and Australia.—These land-bridges changed the direction of the ocean streams. You know in the age of reptiles there was nothing to divide the Atlantic from the Pacific. Added to that, the high mountain ranges took the moisture out of the winds from the oceans, as the Rockies now do the Pacific trade winds, so that by the time they reach Nevada there is no moisture left in them to form clouds and fall in rain, and we have desert.

"Of course the animals that lived on the earth in its flatter, more temperate stage now have to adapt themselves to life on high, cold elevations, or in dry, hot desert areas, or to migrate via the land-bridges to more favorable climates. Those unable to do this perished.

"For instance, take the age of reptile dominance, (the Mesozoic Era,) which was in turn divided into four periods, those of dinosaurs, (the Triassic period, a rock from which I showed you, if you remember,) the Jurassic period, which gave rise to flying reptiles, from which

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our first birds were derived; the Comanchian period, which gave rise to flowering plants and the higher insects, and the Cretaceous period, when our most primitive mammal forms evolved.

"At first the earth was peopled with dinosaurs and flying dragons, and the seas by squid-like mollusks. In those days all the earth was level, swampy, tropic and overgrown with giant tree ferns and a primitive conifer.

"As the high mountain ranges arose and deserts were made, these forms gradually gave way to flowers and hardwood forests, peopled with insects and mammals. Only the most intelligent forms survived, and the struggle itself developed a higher degree of intelligence."

"What in tarnation were *dinosaurs?*" asked Long Lester.

"Oh, haven't you ever seen pictures of them?" laughed Ace. "Picture a giant lizard, perhaps 40 feet long——"

"Here, here," protested the old man. "I don't bite."

"It is perfectly true," said Norris soberly.

"Honest Injun!" vowed Ace. "One of these fellows was a sort of cross between a crocodile

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and a kangaroo, what with his long hind legs that he could walk half erect on. There were some as small as eight or ten inches, too, and some so large that you wouldn't have come to his knee. His big toe was as long as your arm."

"And how do you know all that?" protested the old prospector feebly.

"By their bones,—fossils.—Why, there have been fossil bones of a dinosaur found right in the Connecticut Valley! There was one found a hundred years ago in Oxford, England. We have heaps of fossils of them out West here. In fact, this part of the world used to be their stamping ground, though fossils of them have been found as far away as New Zealand."

"Did they eat people?" gasped Lester.

"There weren't any people in those days to eat, but some of them preyed on other animals, and some browsed on the herbiage of the swamps. They didn't have much of any brains, the Triceratops, dinosaurs twice as heavy as elephants, that looked like horned toads, didn't have two pounds of brains apiece, or so we infer from the size of their skulls. They knew just about enough to eat when they were hungry,

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and not enough to migrate when things got unlivable for them, and so they perished off the face of the earth."

"I'm shore glad of that," the old man heaved a sigh of relief. "I'd shore hate to 've met up with one of them fellows."

"And next time I want to cast aspersions on any one's intelligence," shouted Pedro, "I'm going to call him a—what was it?"

"*Triceratops,*" said Norris. "Some dinosaurs,—in fact, most of them,—lived in the swamps, and had long, snakelike necks and flat, apparently earless heads, and long tails. But Triceratops had a three-horned face, one horn over each eye to protect it in battle and one over the nose. Of course he was the largest animal of his time, but he probably fought rival swains for his lady love. We have a pair of Triceratops horns in the National Museum. One is broken, and it must have been broken during life, for the stump is healed over. There were many other kinds of dinosaurs. If we come to any fossil remains, I'll tell you more about them. "But," (stifling a yawn,) "I guess you fellows have had about all you can stand for to-night."

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The boys protested to the contrary, but Norris promised the rest of the story their next evening together around a bon-fire.

In the middle of the night the boys were awakened by a terrific racket. Long Lester was yelling for all he was worth. Every one started wide awake, and Norris threw a handful of browse on the fire to light the scene. Then the old man managed to articulate: "Gosh A'mighty!—I sure thought the Dinosaurs were arter me!"

"You've been dreaming," Norris laughed, while the boys fairly rolled over one another in their enjoyment.

Ace and Ted now made two flights daily in search of the Mexicans, or the smoke of their cook-fire.

Next day they came to a canyon that filled the Geological Survey man with profound enthusiasm, for, he said, it illustrated both the last glacial period and the last period of volcanic mountain building. First they noted that the little mountain stream had worn its torrential way through the basalt or volcanic rock in a narrow canyon perhaps 200 feet deep. A flow of molten basalt, accompanied by cinders,

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had been erupted from the 8,000 foot peak at the upper end of the canyon, and had flowed down in a layer 200 feet thick when it hardened. It had flowed,—as the underlying rock still showed in places,—over a lateral moraine or rock débris left by a glacier as it flowed down that way. And from the weathered condition of this rock débris, Norris said, it must have been a glacier, not of the last ice age, but of the one preceding,—for of the four glacier periods generally recognized by geologists to-day, evidences of the last two can be seen in the Sierras.

"What made this little canyon even more of a find, (from the point of view of what he wanted to show the boys,) was that on top of the volcanic rock lay the deposit from another glacier, one that flowed in the last ice age, as the condition of the rock débris plainly showed the expert.

The boys tucked a few rock specimens into their packs and launched an avalanche of questions. But he made them wait till they had established all snug for the night beside a stretch of rapids, where they could look forward to catching trout for breakfast. Then, lighting

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his pipe, and stretching his feet to the bon-fire, —for the night wind swept cool upon them,— Norris began with Ted's question as to glaciers and volcanoes.

"During the times I spoke of last night, when the earth crust is breaking, the molten rock and gases and water vapor in the interior of the planet rise in the hearts of the mountain ranges, and often break through as active volcanoes, pouring their lava and ash over the underlying granite, and building it still higher.

"These heightened mountain ranges bring about the glacial climates. For the snows on their cold peaks do not melt when summer comes, and consequently they accumulate, and accumulate, till their own weight presses them down as hard as ice,—that is, makes glaciers of them. I am going to be on the look-out for a glacier, for you will have a good chance to see them in this region. At the same time, during these glacial periods, the astronomer could explain how it is that the temperature is from ten to twenty degrees colder in both winter and summer than it is now, so that helps the ice to accumulate. Then the glacier, flowing slowly, slowly, (a river of ice,) down the mountain-

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sides, carries with it quantities of the underlying rocks, till it reaches a lower level where the ice melts and it becomes a river and carries those rocks and soil to the sea. That way, the mountains are gradually worn down to sea level and the whole cycle is ready to start over again."

"I see," said the ranch boy. "How long ago did you say the last glacier period came?"

"Probably not since the time of the first men,—perhaps 30,000 years ago."

"And those glacial deposits you showed us to-day are 30,000 years old?" the boy breathed.

"Yes, and the deposits from the glacial period before that are older still,—a souvenir from the age of reptile dominance."

"Then when did the other ice ages come? Did you say there were five?"

"I did, but only four great ones. There were two away back in the age of invertebrates."

"Then has the climate been the same since the last ice age?"

"Not at all. The change is gradual, and geologists naturally conclude that some time we will have another ice age. We'll hope man has found a better way to keep warm by that

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time.—Our climate, with all its ups and downs, is little by little, through the centuries, growing colder!"

"And how do you know about all these ups and downs of climate?" challenged Long Lester.

"Why, for one thing,—we don't have to read it all from the rocks,—there is a plain story in the rings of growth in the Big Trees. Don't you remember those cut stumps, and the thousands of rings we counted, one for a year? And some were wider than others, because in those years there had been more rainfall."

"Well, I never!" was all the old prospector could articulate, as all hands once more called it a day.

Next day Ace searched in concentric circles, but without finding a trace of Mexicans, or, indeed, of any one.

The next night found the little party encamped an eight hours' hike up the side of another glacial polished slope. The trail,—that is to say the way they picked to go,—led first to the upper end of the canyon and over the rocks that bordered a green-white water-fall. The wind blowing the spray in first one direction and then another, they got well wetted, though

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the clear California sunshine soon dried them again. But the most curious part of their climb past the falls was the rainbow that persisted in following them till they seemed to be at the hub of a huge semicircle of opalescent tints.

Above, (perhaps eight hundred feet higher than their camp at the hot spring,) they came to where the river slid green and transparent over granite slopes just bordered by a fringe of pine. The water ran deep and swift, though, and as Ted stooped to drink, he found that, rhythmically, a larger swell, (call it a wave,) would slap him in the face, till once, blinded by the unexpected onslaught, he all but lost his balance. It would have been inevitable, had he done so, that he should almost instantly go hurtling over that eight hundred foot drop, whose waters roared till the boys had to shout at each other to be heard even a few paces away. But the water was deliciously icy, from its fountain-head in the glacier above.

Wide slopes just steep enough to make climbing demand considerable sure-footedness widened this hanging valley on either side, with no greenery save the picturesque bits that grew

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along the weathered cracks. Beyond this, the canyon walls continued to rise abruptly.

Trailing along beside the river till it had widened out and quieted its song, they found one of the typically open, parklike, forests of silver firs, jeweled with occasional emerald meadows fragrant with purple lupin and gay with crimson columbine and golden buttercups. Under foot were white violets and wee, monkey-faced mimulus, with occasionally a rare scarlet monkey-flower.

They passed one of the tributaries of the river, crossed it on a log, and paused to drink deep of its sweet fluid. They found a huge fallen log with a mushroom growth that Pedro pronounced edible and which they found not unlike cooked crab meat. They crossed other brooklets, paused at noon to eat a dry lunch, and to their amazement spied a doe and her half-grown fawn in the edge of the clearing watching them wistfully as they threw their scraps away. Pedro, approaching softly, and casting peace offerings before him, was able to approach to within several paces of the mother, though her young hopeful was less trustful. Having probably never seen a biped before, both animals

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were consumed with curiosity and comparatively unafraid. The old prospector suggested with a wink that a little "wild mutton" would not go amiss, the game laws being adaptable to the needs of those in extremity, but Norris reminded him that they were no longer in extremity, and the boys voted unanimously not to betray the trust of this wild mother.

Now came a stiff climb around a rocky shoulder of the mountain, and along the cracks of the smooth rock slopes, as once more they traversed the path of an ancient glacier. The opening here between the two folds of mountains again disclosed their river, now smaller, but if anything even noisier, by reason of its race over a series of cascades. They had left the silver fir belt and were in the region of dwarfed mountain pines.—They estimated that they must be about 8,000 feet high.

Ace joined them with still no news of the fugitive fire setters. It was mysterious.

It being Ted's and Pedro's turn to make camp that night,—they dropped the packs under a gnarled old juniper whose trunk had been split by lightning into seven splinters that curved out over a little hollow, making an ideal

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shelter, with its fubsy foliage, its storm-twisted limbs making natural seats, and a flat-topped rock a table. They had to carry pine boughs some distance for their beds, as they did wood and water. Then they sallied forth for a string of fish.

All this gave Ace, Norris and Long Lester time to climb the short remaining distance to the top of the ridge, where they could gaze across at snow-capped peaks on which the alpine glow of approaching sunset had spread a luscious rose.

While they were reclining in quiet enjoyment around the supper fire,—the last flutter of the breeze fanning their faces,—a tawny, catlike form suddenly came tip-toeing out from behind an edge of rock. It was an animal possibly a hundred pounds in weight,—the California mountain lion is not a heavy animal,—and for all its wide, heavy looking feet it trod with lithe grace. (Those paws, so well adapted to travel over deep snow, would enable it to seek its prey when white winter shut down over all its hunting grounds.)

Now it was to all of them a rare treat to see a lion so close to. Of all the denizens of the

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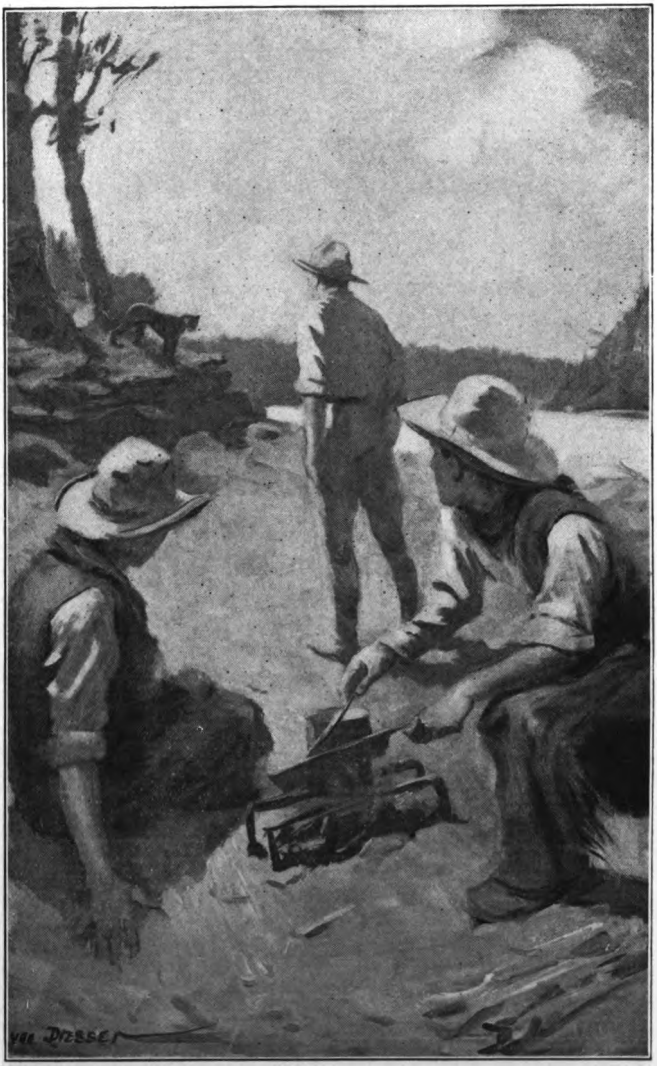

It was a rare treat to see a lion so close.

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wild, none are so shy of human kind, in regions where they are hunted,—none so thoroughly nocturnal. The three men fairly held their breaths to watch.

First the animal leapt to a branch of a wind-beaten tree and crouched along its limb, lying so still that, had they not seen it move, they might have glanced squarely in that direction and never noticed. And there it lay, sharpening its claws, cat fashion.

Suddenly it began narrowing its yellow eyes at what must have been a movement behind the rock whence it had emerged. Gathering its feet for a spring, it laid its ears back, and the great muscles rippling beneath its skin, leapt at a second lion whose head could now be seen peering around the rock. But did they fight? Not a bit of it! With hiss and arching back, and all claws out like the picture of a witch cat, the young cougar challenged his playfellow, then retreated as the other would have given him a swipe of his paw. Back to his tree he raced, the other after him. But no sooner had he reached the vantage point of his horizontal branch than he turned and chased the other back. This play was repeated several times,

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while the three men watched to the windward, silent and motionless, and hence unseen by the near-sighted animals.

A small rock had been loosened by their scramble, and as it went rolling over the granite slope, the first cat pounced after it playfully, finally catching the rolling stone and leaping about it as a cat does a mouse. Then he retired to his tree.

Norris, reflecting that the near presence of two such animals would stampede the burros, picked up a stone and threw it at the lion, intending, not to hit it, but to chase it away. To the surprise of the onlookers, the huge cat pounced on the stone as playfully as before. Ace now hurled a small rock so that it just escaped the tawny flank, but again she pounced, as playful as a kitten, at each missile, and it was not till the three men rose and shouted that the lion took alarm and raced away.

"I declare!" exclaimed Pedro, when he heard about it, "I'd never have believed it!"

"I was out in Devil's Gulch one day," remarked Long Lester, "with a coupla dogs. It's all granite,—hard for the dogs to get a scent,

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but there's lots of lions there, in among the rocks. Finally, though, they got one into a little Digger Pine. I took a shot at her, and out she tumbled."

"Dead?" asked Norris.

"Yes.—The dogs found her den, and dragged out three cubs."

"How large?"

"About the size of house cats, that's all."

"Then what?"

"Oh, I put 'em into my shirt and tuk 'em home. I sold 'em afterwards to a circus man."

"Well, do lions always act the way this one did to-night?"

"I heard tell of a boy that was out with an old three dollar Winchester 22, and a dog that had lost a leg in a bear trap. Pretty soon he barked 'treed.' He had a lion up in a scrub oak. It came down fighting, so the boy had to circle around trying to find a chance to shoot. Then it jumped up into a pine tree and lay with its head over the limb looking down at him. He shot at it, but I guess it didn't hit, for it ran again, and by jings, it finally got clean away!"

"Don't they ever fight?" marveled Pedro.

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"They'll fight a dog if they come down wounded, but the big cats are mostly cowards."

"But bears are not?"

"Bears? No, nothing cowardly about them. They're more lazy'n anything else."

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CHAPTER XI

THE VALLEY OF TEN THOUSAND SMOKES

THE next morning they had a good look around before deciding which way to go. On one side pointed firs in patches on the canyon walls contrasted with the snow in the ravines. There was a brook that divided, then reunited in white strands, only to spread out into a smooth, glistening sheet, golden in the sunlight, to join the green river.

The notches between two rounding, glacier-smoothed granite masses disclosed distant peaks, snow-capped, their jagged ledges thrusting through the mantling white, dazzling in the sunshine like a mirror,—now gray under a hazing sky, now dappled under a passing shower cloud.

They finally decided to wind through the gap, and Pedro, Norris and Long Lester started on with the burros, while Ace and Ted started fine-

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combing the map beneath them for the elusive Mexicans. Very probably, they thought, they had been hiding in some of the caves that honeycombed the region, and sooner or later they would have to reappear.—Their supplies could not hold out forever.

All along the Western flank of the Sierra, (as both Norris and Long Lester were able to assure them,) from the McCloud River in the North to the Kaweah,—a distance of at least 400 miles,—stretched a belt of metamorphic limestone, reaching up to as high as 7,000 feet, and it was fairly riddled with caves.

But again the day went by without success. Ace only squared his chin. Ted offered to abdicate his observer's seat in favor of any one of the party, but Pedro and Long Lester preferred terra firma, and even Norris found more to interest him in the rocks beneath their feet.

Once a little spiral of smoke drew them to a canyon head where they found three fishermen with a pack train of seven horses,—but no Mexicans. They searched Southward along the John Muir trail, returning along the Eastern flank,—but to no purpose, so far as the fugitives were concerned.

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As no one had had time to fish, they dined on tinned corned beef, which Ace, the cook for the day, made the mistake of salting. (After that he had to make tea twice.)

"One thing I'd like fer to ask you, Mr. Norris," said Long Lester that night around the bon-fire, "is where does the salt in the ocean come from? I don't see for the life of me, from what you've told us——"

"The salt was originally in the rock of the earth's crust," Norris explained with a pleased smile at the old man's interest. "As this igneous rock weathered with time, the rain and the streams washed it into the ocean. Then when the sea water evaporates——"

"To make clouds, to make more rain?" Long Lester recited.

"Yes,—the salt of course remained behind, so that the oceans have been growing constantly saltier since the earth began. Yet even now sea water must be nine-tenths evaporated before the sodium begins to precipitate, as we say."

"So there is room for a lot more."

"Especially as the oceans are growing larger all the time."

"But doesn't the ocean give it back to the

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land when it leaves these sediments along the shore?"

"Not to any extent, speaking comparatively. But one of the interesting things about the salt in the sea is this: Chemists and geologists estimate that, for the amount of salt in the sea, enough of the original earth crust must have been weathered away to have covered the continents over 6,000 feet high. And that calculation just about fits what we believe to have happened.

"The United States Geological Survey gave out an official statement in 1912 that this country is annually being washed back into the ocean at the rate of two hundred and seventy million tons of matter dissolved in the streams and five hundred and thirteen millions of tons of matter held in suspension in the same streams. That is to say, the oceans every year receive from the surface of the United States seven hundred and eighty-three millions of tons of rock materials.

"That means that, here in this part of the country at least, one hundred and seventy-seven tons per square mile are being washed back each year."

"Gee!" said Ted. "I should think, at that

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rate, that the continents would have been all washed away long ago."

"Yes, there have been, since geological history began, at least twenty whole mountain ranges as high as the Rockies worn to sea level. Of course the oceans have periodically flooded the margins of the continents at such times, in long troughs where now stand our Appalachian and Rocky Mountain ranges, leaving their deposits.

"In the Rockies there are coarse sediments miles deep, together with limestone formed of the ground-up shells of marine animals of the earlier times.—Now think of this!

"If all the stands above sea level in the United States to-day were to be washed into the sea, as it undoubtedly will be, in time,—(but not in our time,) the level of the oceans will rise, (just as the level of a half glass of water rises if you drop in a handful of sand,) until—it has been estimated—everything under six hundred and fifty feet above sea level will be inundated. That means that probably half of the continent would be under water. It has been so in times past, and it will be again. In fact, in the age of reptile dominance, (the Cre-

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taceous Period,) when the earth was just beginning to be peopled with birds and flying reptiles, and the first, primitive mammals,—the Atlantic flowed straight from what is now the Gulf of Mexico, through what is now the Rocky Mountain Region, and through the Eastern part of Alaska, to the Arctic. That left one strip of land that reached along what is now the Pacific Coast, clear from the Isthmus of Panama to the Aleutian Islands and straight across to Siberia. The Northern part of the Atlantic Coast formed another land area, broken by the fresh water bodies of America and Canada and in one with a strip of land that extended across Greenland to Europe.

"It is pretty well established, in fact, that the United States has been more or less flooded by warm, shallow marine waters at least sixteen times since the age of fish dominance began.—But not since the age of man!" he hastened to assure the old prospector, who was beginning to look uneasy.

"Of course these flood times brought a moist, warm climate to the land areas, and life was easy for the then existing animal forms. Then when readjustments in the earth's crust again

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raised up mountain ranges and the climate became colder and drier, the struggle for existence became more intense, the process of evolution was stimulated, and new forms originated.

"We are living in one of those periods now. —The organic world is being stimulated to develop even better bodies, endowed with even more alert brains.

"Life is easiest of all for the inhabitants of the ocean. That is why they have developed so little intelligence."

"Is that why it's such an insult to call any one a poor fish?" grinned Ted.

"An ichthyosaurus?" supplemented Ace.

"As has been said before," Norris took up the thread of his talk, "with a drier climate and soil, comes the need of developing a faster mode of locomotion, for food no longer lies or swims —everywhere about, as it did in the ocean, and in the swamps, and tropic humidity. Food and water are scarce, and it is the speediest animal that fulfills his needs. This speediness on his part means that he uses up more energy, and hence needs more food, and he needs to assimilate it faster. In other words, it means increased metabolism. This in turn means that

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he keeps his body at a higher temperature. He needs it too, now, with the increased cold. This results in the development of warm blood, by which the animal can maintain his body warmth regardless of winter cold. If it had not been for conditions that forced certain reptiles to develop warm-bloodedness, we would have no birds or mammals to-day, for as you doubtless know, birds and mammals both were evolved from reptiles."

"I swan!" was all the old prospector could say.

"Yes, the first mammals developed from a reptile known as the cynodont. Many of these reptiles had long legs and could travel with the body well off the ground. Birds originated from the same reptilian stock as did the dinosaurs. First their hind-legs grew long so that they could run on them,—and you will notice at the Museum how the legs of a dinosaur are joined to the body exactly like a birds,—then their scales gradually evolved into feathers.

"There is a lot more to it than I can tell you now, but after various ups and downs, dinosaurs became extinct and Nature tried out several kinds of warm-blooded, furry mammals,

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some of them herbivorous and built for speed to run away from their enemies, some of them swamp-dwelling monsters with heavy legs and small brains, who, slow of movement, relied on horns and other armor and sharp teeth for their defense.

"But there is no end to this subject. I only mean to make the point that it was geological changes that drove the fish to land, and the land animal to higher forms, till finally other geological changes drove man's ancestors down out of the trees." The boys, no less than the old prospector, testifying their interest in the last named operation, he continued.

"When the Alps, the Andes and the Himalayas arose, man's ancestors still lived in trees. But high mountains hold a large part of the moisture of the atmosphere in the form of snow and ice, and at the same time the decreased oceanic areas offer less surface for evaporation. Not only does that mean a drier climate, but the sun's rays pass more freely through dry air, and the days are hotter, and the heat passing freely back through the same dry air at night, the nights are colder. Seasons are more extreme, and ice accumulates on the mountain

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tops and around the polar region, precursor of a glacier period. The aridity decreases the amount of forest, and the manlike tree dweller had to descend to the ground to get his living. That necessitated the development of his hind legs for speed, and that speed necessitated his assuming a wholly erect posture. That in turn freed his hands, and he, or the man descended from him, could defend himself by throwing stones at the huge beasts who then peopled the earth. The cold winters necessitated the use of the skins of beasts for clothing, and so on through the list. It was geological necessity that drove man into his higher development.

"Changes of climate and environment, however, are stimulating, even to-day. Statistics show that stormy weather actually increases people's energy."

The next day they passed a long crack in a rock slope, which Norris felt sure had been made by an earthquake, perhaps as recent as that of 1906, to judge from the cleanness and newness of it. The crack was no more than a foot or two in width, but in places eight feet deep, they estimated, and along the Western

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side of it stood a fault scarp, in this case a wall of granite bowlders of various sizes up to four or five feet in height.

"This," pronounced the geology man, "is evidently a region overlying subterranean volcanoes, which might even yet build the range higher. I'll bet that kind of mountain building may still be going on around here."

Again and again Norris, or even Ace, had been able to point out, in the record of the rocks, the evidences of the two glacier periods that had helped shape the Sierra Nevada, the earlier one much larger, and enduring longer, as shown by the moraines (or deposits) left behind. The lower end of a canyon would be no wider than the stream that incised it, but the upper portion would have been smoothed into grassy parks or lakelets on each tread of a giant stairway to the summit of the range.

Rounded waterworn pebbles and cobblestones among a mass of angular bowlders, left behind by glacier streams, together with an occasional striated pebble, were "sermons in stones" to the geologist.

"Hey, Ted," his chum had challenged him that day, "did you ever see a pirate?"

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"Don't know as I did," admitted the ranch boy.

"Then I'll show you one. Climb in," and he prepared to search once more for the Mexicans.

"Show me one! You speak as if they kept them in museums."

"This pirate will be a river. A river pirate, —I mean a pirate river! If I could find the divide just North of Muah Mountain I'd show you where streams are being captured this minute. Cottonwood Creek has already captured one of the tributaries of Mulkey Creek, I hear, and diverted it into an eastward flow, and further captures are likely to be pulled off any time. Isn't it a scandal?"

"I say, Ace," protested his chum, "I've swallowed a lot since we started on this trip, but I'm not so gullible as you seem to think."

"Look here, old kid," said Ace seriously. "It's a fact. Along a divide, a stream flowing one way will divert one flowing the other way into its own channel."

They found a pirate river,—but still no trace of the incendiaries. However, that merely determined the Senator's son the more.

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That night Norris told them the long promised tale of his Alaskan trip.

"Nothing like the Valley of Ten Thousand Smokes has ever been seen by the eye of man," he declared. "If we could take all the other volcanic regions of the world to-day and set them down side by side, they would present less of a spectacle, except, of course, at the time of a dangerous eruption. There has been nothing like it in the memory of man,—though geologists can read from the rocks that such conditions must have existed in past ages. The Mt. Katmai eruption of 1912, one of the most dangerous in history, first attracted attention to this region, and the National Geographic Society has since sent various expeditions to Alaska. It was that way that the Valley came to be discovered, in 1916.

"I happened to be a member of the last expedition."

"Honestly!" the boys exclaimed.

"Yes, and I tell you, boys, when I first looked through Katmai Pass, it just looked as if the whole valley were full of smoke. Of course it was steam."

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"Weren't you afraid of another volcano?" asked the boys, snuggling down ready for a real story.

"No, because with all those vents letting off steam, it must relieve the pressure from below, like so many safety-valves.—Two black, glassy looking lava mountains guard the pass. The wind on the side of Observation Mountain was blowing so hard it honestly lifted us off our feet at times, and it blew a hail of pumice stone in our faces that literally cut the flesh. Of course we wore goggles.

"Once in the valley, there were certainly all of ten thousand smokes rising from the ground. We were simply speechless, it was such an awesome spectacle."

"I'll bet you were!" breathed Ted.

"Personally, I consider it more wonderful than either the Grand Canyon or the geysers of the Yellowstone.—As far as we could see in any direction,—and there seemed to be three arms to the valley,—the white vapor was steaming out of the ground until it mingled with a great cloud that hung between the mountain walls. And we later camped in places where we could keep our food in a hollow of a glacier

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while we boiled our breakfast in a steam hole, and the ground was almost too warm for comfort."

"Must have been an ideal camping place," said Ace.

"Far from that. Too much danger of breaking through. And then of course there wasn't a tree or a grass blade anywhere, much less a stick of firewood. But we sure had steam heat at night, and we cooked, in the milder of the fumeroles."

"Wasn't there a lot of gas coming up with the steam?" asked Ace.

"Yes, but it didn't taint our food any. It was an ideal steam cooker. Farther down the valley were some vents hot enough to fry bacon."

"I should think it would have steamed it," said Ted.

"No, we found one vent where the steam came so hot that it didn't condense for several feet above ground; the only trouble was that the frying pan had a tendency to go flying up in the air and the cook had to have a strong arm to hold it down."

At the picture his memory evoked, Norris

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burst into hearty chuckles. "As the bacon got crisp, of course it didn't weigh so heavy, and there always came a point where it began to fly out of the pan. Then we'd all stand around, and it was the liveliest man that caught the most breakfast.

"There was another camp convenience, too, there in Hades, as the valley has been named."

"Thar, didn't I tell you so?" triumphed Long Lester.

"And they named the river Lethe. A river that ran down from the melting glaciers,—though it almost all goes up in smoke, as it were,—in steam, before it gets out of the hot part. This river whirls along, and in places the steam actually boils up through the ice water, or along the banks. I used to think it was an awful pity there were no fish in that stream, because we could have cooked them without taking them off the hook."

"Huh!" The old prospector shook his head. "I've thought all along this here was a fish story."

"But it's gospel truth," Norris assured him. "I mean about the valley. I *said* there were no fish.—Everything we ate, by the way, had to be

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packed in on our backs. It was no place for horses, where in places the ground fairly shook beneath our feet, and if it were to give way, we'd find ourselves sure enough in hot water."

"It must have been almighty dangerous," gasped Ted.

"Well, not after we learned the ropes. Sometimes we accidentally put a foot through a thin place and steam came through. I assure you we stepped lively then. At other times our feet sank into the soft, hot mud.

"By the way, there is a mountain across the head of the valley that looks like a crouching dog, and it has been named Cerberus."

"Were those geysers, those ten thousand smokes?" asked the old prospector.

"No, a geyser comes after volcanic activity, while here something is still likely to happen. A geyser begins as a column of steam and hot water, which erupts as often as the water gets to the boiling point. It follows that the water must accumulate in rock not so hot that it would instantly vaporize it. But the rock underlying this valley is so hot that no water can accumulate."

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"How large are the vents through which the steam comes?" asked Ted.

"All sizes down to nothing at all. There are even a few craters 100 feet across, that have been produced by volcanic explosions. You will find these craters, generally, along a large fissure, just the way you find Aleutian chain of volcanoes along a fissure in the earth's crust several hundred miles in length.

"There are fissures all along the margins of the valley, besides those in the center, and many of these have one side standing higher than the other, showing them to be earthquake faults,—the same sort of thing we see here in the rocks of the Sierras. And you should hear the hissing and roaring of the steam as it forces its way up through these fissures from the hot depths beneath. Sometimes it looks like blue smoke, it is so full of gases, especially sulphur dioxide, the gas that is given off by burning sulphur. So the popular notion of Hades isn't so far off after all, eh?"

"Could you smell the sulphur fumes?"

"Sometimes, yes,—when the other gases did not overwhelm the odor. But the weirdest part of all is the incrustations along the borders of

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the vents. All colors of the rainbows—shapes as fantastic as anything in fairyland. Lots of yellow, of course, from the sulphur,—crystals of it, some of them neighbor to an orange tinted crystal, lying in the blue mud. It was a beautiful color combination.—Then there were green and gray alum crystals which looked like growing lichens.—There were also deep green algæ actually growing. Strange how certain designs are used over and over again in nature! In other places the mud is actually burned brick red, especially where the fumaroles are burnt out. This shades to purple, and in other places to pink. But the most surprising, perhaps, were the white vents just tinted with a delicate pink or cream.

"The largest fissure of all, one lying at the foot of Mt. Mageik, is filled with the clear green water of a melted glacier. And above, the mountain smokes away into the clouds!"

"It must be a marvelous place!" said Ace. "I suppose it was regular ice water."

Norris laughed. "That is the funny part of it. It's not. The water is actually warm, or rather, tepid, in places, on account of the heat from below."

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"So you had good swimming even in Alaska."

"We might have had. And then I must tell you about Novarupta. That's the largest vent in the valley, and it is something you won't see very many places in the world, a new volcano. It was only formed at the time of the eruption of 1912, and it is one of the largest volcanoes in the world to-day,—with a crater much larger than that of Vesuvius."

"But Mr. Norris, do y' mind my asking," Pedro hesitated, "but how do you know it is a new volcano? Don't volcanoes sometimes burst forth again after many years of quiet?"

"They do, but there is where the rocks tell the story again. Instead of bursting forth from a mountain top, through igneous rock, (left from the time when the earth-crust was molten,) this one erupted in the valley, in sandstone. On a still day, the smoke will rise as high as ten thousand feet."

Norris, then a student, had been one of the first to view Lassen Volcano when, in 1914, it broke its slumber of 200 years. Indeed, he had had a real adventure, as the second outburst had caught him within half a mile of the crater

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and he had barely escaped with his life. Of course the boys had to hear all about it.

While the Sierra south of Lassen has been built more through uplift than volcanic activity, at least since the Tertiary period, he explained, the Cascades and indeed, the whole range to the northward through Oregon and Washington, is a product of lava flow.

Happening to be about to start on a camping trip in the Feather River region at the time of the first eruption, he and his companion had hastened immediately to the scene of so much geological history making. The smoke and ashes that billowed forth had been visible for fifty miles, and the accompanying earthquake shocks had been accompanied by a downpour of rain.

Climbing the path of a recent snow-slide, which had cleared a narrow path in the fifteen-foot drifts, they could smell sulphur strongly from near the South base onward. Veering around to the East, past half a dozen cinder cones, they finally reached a narrow ridge leading directly to as yet unoccupied the fire outlook station. Clambering over crags so steep,

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finally, that they could not see ahead, they came to the little square building, now tattered by the stones that had fallen through its roof, tethered to the few feet of space available by wire cables that seemed to hold it down in the teeth of the winds. Suddenly below them lay the bowl of the ancient crater, bordered by snow fields now gray with ash. That the ash had not been hot they judged from the fact that it had nowise melted the snow, but lay on its surface. From the ragged edge of the steaming basin, yellow with sulphur, rose the oppressive fumes they had been getting more and more strongly. How deep was this funnel to the interior of the earth? To their amazement it appeared to be only about 80 feet deep. That, they decided,—coupled with the fact that the ash and rocks exploded had not been hot, but cold, must be because the sides of the crater, as they gradually caved in, must have choked the neck of the crater with débris, which had been expelled when the smoke and gases had been exploded. There had been no lava flow, then!

They had retraced their steps to perhaps half a mile's distance when of a sudden the earth beneath their feet began to heave and rumble

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thunderously. Ashes and rocks, some the size of flour sacks, some huge bowlders, began shooting into the air,—observers at a distance assuring them afterwards that the smoke must have risen 3,000 feet above the peak. It grew black as midnight, the smoke stung their eyes and lungs and whiffs of sulphur nearly overwhelmed them.

It was a position of deadly peril. Quick as thought, they ran, Norris dragging his companion after him, beneath the shelter of an overhanging ledge, where at least the rocks could not fall on them, and there they buried their faces in the snow and waited.

What seemed hours was later pronounced to have been but fifteen minutes, though with the roaring as of mighty winds, and the subterranean grumblings and sudden inky night, the crashing of stones and thundering of rolling bowlders, it seemed like the end of the world.

Norris's companion had suffered a blow that dislocated his shoulder, but otherwise they emerged unhurt. They afterwards found several areas on the sides of Lassen where sulphurous gases were escaping from pools of hot mud or boiling water. They also visited a lake that

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had been formed at the time of the lava flow of 200 years ago, (now a matter of legend among the Pitt River Indians,) this lava having formed a dam across a little valley which later filled from the melting snows. The stumps of the inundated trees could still be seen.

A geyser, said the Geological Survey man, is just like a volcano, only it expels steam and boiling water from the interior. There is a line of volcanic activity up and down the Pacific Coast, from Alaska to Central America, though Lassen is the only active peak in California, Shasta having become quiescent save for the hot spring that steams through the snow near its summit.

The North half of the range, he added, is covered with floods of glassy black lava and dotted with extinct craters, whereas the Southern half is almost solid granite, though there are plenty of volcanic rocks to be found among its wild gorges. The rocks around Lassen tell a vivid story of the chain of fire mountains that must have again and again blazed into geysers of molten rock, till the whole smoking range was quenched beneath the ice of that last glacier period, which through the ages has been sculp-

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turing new lake and river beds, and grinding soil for the rebirth of the mighty forests.

The boys drowsed off that night to dream of fire mountains and explorations in the nether regions.

The next day they planned to bi-plane up and down the John Muir trail again and see if the Mexicans could have crossed to the Eastern side of the range. They might have made their way through some pass, traveling after night-fall and hiding by day, and once on the desert around Mono Lake they would be easy to locate. For it seemed ridiculous that they could actually make a get-away.

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CHAPTER XII

GOLD!

IN the pass between two appalling peaks the two boys sighted the smoke of a cook-fire, and without once reflecting that they were unarmed, pan-caked down for a closer inspection. But there was no need to land. It was a band of Indians. And though they searched till they were ready to drop with fatigue,—and all but frozen stiff in those high altitudes,—not the sign of a Mexican did they sight after that.

They returned utterly discouraged.

"What kind of Indians were they?" asked Long Lester.

"Oh, just Indians," said the ranch boy.

"That is like saying, oh, just whites," said Norris. "Indians differ more than you would ever imagine."

"Why is that, Mr. Norris?" Ted wanted to

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know. "They're mostly mighty good for nothing specimens, to judge from our Diggers."

"I'll tell you after supper," Norris promised them.

Pedro had been out with his trout rod. Descending to the river, which here circled around a huge bowlder from which he thought he could cast, he had a string in no time.

Now Pedro was thoroughly well liked, with his Castilian courtesy and his ever ready song. The lack of physical courage had been his greatest drawback. Always had the fear been secret within him that at some crucial moment he might show the white feather. His experience with the Mexicans had removed that, but he was still mortally afraid of three things,—bears, rattlesnakes, and thunder storms,—that is, real wild bears, not the half tame kind that haunt the Parks.

Still, he had not noticed the furry form that stood neck-deep in the riffles, fishing with his great, barbed paw,—so perfectly did he blend into the background.

The shadow of the canyon wall had made twilight while yet the sun sent orange shafts through the trees on the canyon rim. Suddenly

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around the turn of the trail rose a huge brown form that gave a startled grunt, rising inquiringly on its shaggy hind legs and swinging its long head from side to side. Pedro's heart began beating like a trip-hammer. (He wondered if the bear could hear it.)

He wanted to run, to scream,—a course that would have been most ill-advised, for the bear might then have given chase. As it was, the boy remembered that the animal was probably more afraid than he,—or more likely merely curious at this biped invasion of his wilderness,—and would not harm him if no hostile move were made.—The cinnamon bear of the Sierras, like his blood brother, the New England black bear, is a good-natured fellow.

With an iron grip on his nerves, he forced himself to stand stock-still, then back—ever so amenably—off the trail. The bear, finding no hostility intended, turned and lumbered up the mountain-side.

" 'Minds me of one time," said Long Lester, when he heard the story, "I was down to the crick once when I was a shaver, and along came a big brown bear. The bear, he stood up on his haunches, surprised like, and just gave one

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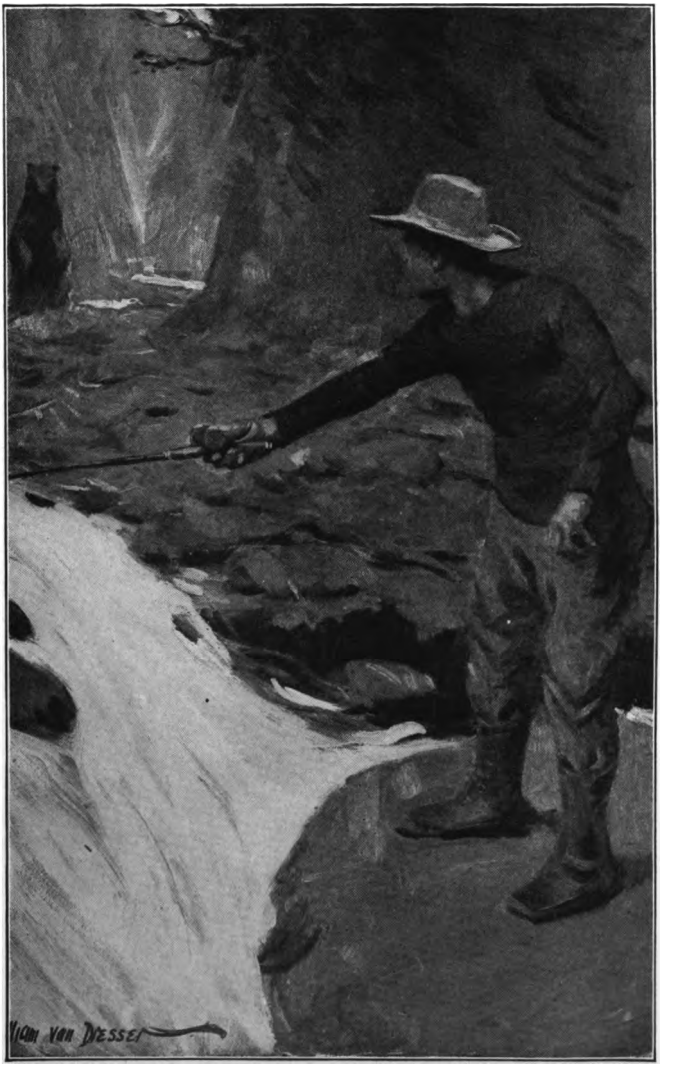

Around the turn of the trail rose a huge brown form.

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'woof.' About that time I decided to take to the tall timber." (At this, Pedro looked singularly gratified.) "Well, that bear, he took to the same tree I did, and I kept right on a-climbin' so high that I get clear to the top,—it were a slim kind of a tree,—and the top bends and draps me off in the water!"

"What became of the bear?" Pedro demanded.

"I dunno. I didn't wait to see. But Mr. Norris here were a-sayin' there's nothin' in the back country a-goin' to hurt you unless'n it's rattlesnakes. Now when I was a-prospectin' I allus used to carry a hair rope along, and make a good big circle around my bed with it. The rattler won't crawl over the hair rope."

The boys thought he was joshing them, but Long Lester was telling the literal truth. "Once I was just a-crawlin' into bed," he went on, "when I heard a rattle," and with the aid of a dry leaf he gave a faint imitation of the buzzing "chick-chick-chick-chick-chick" that sounds so ominous when you know it and so harmless when you don't. "I flung back the covers with one jerk, and jumped back myself out of the way. There was a snake down at

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the foot of my blankets. They are always trying to crawl into a warm place."

"Then what?" breathed three round eyed boys.

"First I put on my shoes and made up a fire so's I could see, 'n' then I take a forked stick and get him by the neck, and smash his head with a stone."

"And yet I've heard of making pets of them," said Norris.

"They do. Some do. But I wouldn't," stated Long Lester emphatically. "Ner I wouldn't advise any one to trust 'em too fur, neither."

"They say a rattler has one rattle on his tail for every year of his age," ventured Pedro.

"A young snake," spoke up Ted, "has a soft button on its tail. And then the rattle grows at the rate of three joints a year, and you can't tell a thing about its age, because by the time there are about ten of them, it snaps off when it rattles."

"Down in San Antonio," said Ace, "we had an hour between trains once, and we went into a billiard parlor where they had a collection of rattlesnakes, stuffed. And they showed

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some rattles with 30 or 40 joints to them."

"Huh!" laughed Ted. "That's easy! You can snap the rattles of several snakes together any time you want to give some tourist a thrill."

"You seem to know all about it," gibed Ace. "They had 13 species of rattlesnakes down in this—it used to be a saloon. And ten of them Western. They had a huge seven foot diamond back, and they had yellow ones and gray ones and black ones and some that were almost pink. —I mean, they had their skins. All colors——"

"To match their habitat," supplemented Norris. "Our California rattler is a gray or pale brown where it's dry summers, and in the Oregon woods where it's moist, and the foliage deeper colored, it's green-black all but the spots. *I've* seen them tamed. There was one guide up there who kept one in a cage, and it would take a mouse from his fingers."

"I wouldn't chance it," shivered Ted.

"Oh, this one would glide up flat on the floor of the cage. They can't strike unless they're coiled."

"I suppose he caught it before it was old enough to be poison," said Pedro.

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"A rattlesnake can strike from the moment it's born. It's perfectly independent a few hours after birth."

"Ugh! Bet I dream of them now." But such was their healthy out-of-door fatigue that they all slept like logs.

It was only the next day, however, that the two boys, Ace and Ted, poking exploratively into a deep cleft in a rock ledge, were startled by an abrupt, ominous rattle, and beheld in their path the symmetrical coils of the sinister one. The inflated neck was arched from the center of the coil and the heart-shaped head, with red tongue out-thrust, waved slowly as the upthrust tail vibrated angrily. A flash of that swift head would inject the deadly virus into the leg of one of the intruders. Yet Ted knew the reptile would never advance to the attack.

Dragging Ace back with him, he instantly placed at least six feet between them, so that, should the snake charge, it could not reach them. But with the enemy obviously on the retreat, the snake glided to cover in a tumbled mass of rocks at one side.

"Gee! We nearly stepped on him!" the

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ranch boy exclaimed, with a voice that was not quite steady. "Next time wo go poking into a place like that, let's poke in a stick first, or throw a stone, to make sure there's 'nobody home.'"

"Wish I'd a brought a hair rope," mused Ace. "We might have had one that would go clear around all our sleeping bags. First chance we get, I'm going to buy one."

"Naw! We won't need one.—Did you ever see a rattler catch a rabbit?" asked his chum.

"No, d'you?"

"Once I was going along when I noticed the trail of some sort of snake going across the road. Next thing I heard a rabbit squeal, and by the time I spotted the snake it had a hump half way down its throat, and it was swallowing and swallowing trying to get that rabbit down whole."

"I consider the possibility of rattlesnake bite the one biggest danger in the whole Sierra," declared Norris, one night, lighting each step carefully over the rocks. "And he does his hunting by night."

"Considerate of him!" laughed Ace, "seeing

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that campers do most of theirs by day. But why is it such a danger? I've heard opinions pro and con."

"Rattlesnake venom disintegrates the blood vessels, makes the blood thin and unable to clot. I knew a man who was struck in the ankle, and they had to amputate the leg, and the very bones of that leg were saturated with the blood that had seeped through the weakened walls of the blood vessels."

"How does it feel to be struck, I wonder?" the boy shuddered.

"This man's ankle became discolored practically immediately and began to swell. Of course the bite was through his sock, which must have kept a little of the poison out of it, and it fortunately did not happen to penetrate an artery. We could have cut and kneaded the wound instantly to clear out as much as possible of the venom before it had time to enter the blood system, but the fellow refused such heroic measures. We should have taken him by force; it would have saved his leg, likely, for ordinarily this, and a ligature, will do the work.

"Or we could have burned it clean, or injected the serum if we'd had it.—But as I was about

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to explain, he soon became dull and languid, breathing noisily, for the poison affected heart and lungs.—It was then that he let us get to work,—almost too late,—or rather, that he ceased his protest. His whole leg swelled and turned black, clear up, he got feverish and nauseated, and for hours he kept swooning off, while we worked over him, almost giving up hope, and one of our men had gone post-haste for an old guide who made the serum,—anti-venom serum."

"Did he finally pull through?"

"With the loss of a leg. If he hadn't had that off pronto, gangrene would likely have set in and he'd have gone."

"But this serum—where do you get it?"

"I don't know.—We got it of a man who made it. First he injected into a mule a tiny drop of the venom."

"How did he get the venom?"

"Killed a snake. You know the poison is in a tiny sac at the root of each fang.—Well, after he had given the mule the first dose and he had recovered, he tried a larger one, then a still larger one, and so on, every few weeks for a year or more, until the mule's blood serum had

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developed enough anti-toxin to make him immune to rattlesnake bite."

"But then what?"

"He let some of the mule's blood, separated the serum, sterilized it, and put it up in sealed tubes, which he kept in the cellar. This serum is injected into the victim's blood with a hypodermic syringe, and if it is used before he has collapsed, it will cure him every time. We really ought to have brought some along, just in case of extreme emergency. I have, however, a bottle of permanganate of potash crystals," and he showed a little hard rubber tube two and a half inches long, one end of which contained the crystals and the other a well sharpened lancet, as the stuff has to be put right into the wound. This outfit, he explained, had only cost a dollar, and was so tiny it could be carried right on the person when in danger of being snake bitten. However, it has to be used instantly, (within three or four minutes at the outside,) "if it is to neutralize the corroding acid of the poison and do any good."

That night a bon-fire built up into a log cabin with a tepee of pine fringed poles atop sent the

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sparks flying, but was not uncomfortably hot except on their faces. These they shaded with their hat brims.

"I wonder why there is so much difference in Indians," mused Ace. "When Dad and I visited the Hopis, there, on our way to the Grand Canyon, we were impressed by their high degree of civilization. Like all the Pueblos, they raised good crops, had a regular government, and even an art. And look at these Digger Indians, filthy, thieving creatures, grubbing for roots like wild animals, eating slugs and lizards, because they are too lazy to cultivate a piece of ground!"

"I remember," said Norris, "one of my favorite professors at Yale always said that civilization was largely dependent upon civilization," and he pointed out the Indians as an illustration. Of course he gave due credit to what he termed inherent mental capacity. But to climate he laid the energy with which that capacity is developed,—always provided there were sufficient material resources. That is to say, even white men with fine brains could not evolve as high a degree of civilization in the

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Arctic Circle as they can where they have the material resources necessary to supply the physical needs."

"But I should think the material resources of the Arctic Circle were a result of the climate."

"In large part, they are. That just strengthens the point that climate has had a lot to do with civilization, and incidentally with the differences between different tribes of Indians. I wonder if I can give his theory straight! Well, anyway, here's the general idea.—It applies quite as much to all nationalities as it does to Indians in particular.

"What is our conception of The Noble Red Man? He is observant, he has unlimited physical endurance, but he does not adapt himself to our civilization, nor does he work out new methods for himself, as we have done since America was settled. He is conservative, in other words,—lacking in originality and inventiveness.

"Of course they came at some stage of their evolution from the primitive home of man in Asia.—So also did the Scandinavians,—so also did the Japanese. But while both of these finally located in cold but not too cold climates,

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nor steadily cold, they were merely stimulated. The Indian, though,—the American Indian,—likely migrated by way of Bering Strait, and passing generations in the Esquimo lands, where it is about all they can manage to keep alive at all during the long, dark winters. The result? Those who were high strung nervously went insane,—just as many an Esquimo and many a white man does to-day, under the necessity of idling in a stuffy hut in the cold and darkness. It was only the mentally lazy who could survive that phase of their evolution. That accounts for certain differences between all Indians and all white men.

"Remember, it wasn't the sheer cold so much as the monotony of the unbroken cold and darkness. The negroes of Africa also failed to progress, but in their case it was the energy-inhibiting equatorial climate, and especially the monotony of unbroken equatorial conditions. The European Nordics,—remember, of ancestral stock originating in that same Asiatic cradle,—had severe cold, and in summer, often, extreme heat,—but there was no monotony.

"The too active Hottentot soon killed himself off, and only the indolent survived. The races

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that have had long sojourns, in the course of their racial wanderings, under desert conditions, where patient endurance is an asset, also suffered a decimation of their more alert members. The stolid were the more fit to survive desert conditions. You will find races now dwelling in favorable climates who may exhibit these unprogressive qualities, but back of them is a history of some experience that has weeded out the more active individuals.

"But am I getting too long-winded?"

"You haven't told us yet why one tribe of Indians will be so different from another, if they both came here via the Arctic Circle," urged Ace.

"Well, there is where another factor comes in,—that of material resources. What could an Arab have accomplished with nothing but desert sands to work with? What can the Esquimos accomplish with little but ice to grow crops? They must secure their food by hunting, and hunters must be nomadic. Nomads cannot carry many creature comforts with them, nor can scattered groups be much mental stimulus to one another. Nor can the arts develop

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when the mere struggle for animal existence demands one's whole energy.

"These Digger Indians came from the as yet unirrigated deserts around Los Angeles, with its long dry season, whereas Hopis and other Pueblos around Santa Fe, though up against as dry a climate, taking it in actual number of inches rainfall per year, have enough of their rain during the summer months to enable them to raise crops, and hence to establish permanent habitats, and hence to work out a form of government, a social system, an art and an organized religion."

"But the Utes around Salt Lake City, who were living on grasshoppers when the Pueblos were eating squash and beans,—utter savages,—didn't they have much the same climate as the Pueblos?"

"What I said of the Diggers of Los Angeles applies to them. Their rainfall did not come at the right time of year to raise crops, and of course in such desert conditions there were practically no wild fruits.

"The Indians of the more fertile parts of North America, like the early people of Europe,

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had wild vegetation to supply the means of subsistence. And the wild vegetation also gave wild game a means of subsistence, to say nothing of the means for clothing and shelter. Of course that is not the whole of the story. There is, for instance, coal and iron, but iron has to be smelted where there is forestation, and we come right back to climate, as one of the principal factors in civilization.

"There is also energy,—zeal, determination. But what about the effect of proper food and shelter on those qualities? And more important, what about the effect of climate?

"Elaborate tests have been made. Without going into all that, perhaps you will take my word for it. But the best climate for either physical or mental efficiency is one that is variable,—for change is stimulating,—and that goes to no unlivable extreme, but offers the cold, dry winter and the warm, slightly rainy summer of, say, for instance, the Eastern United States, or Central Europe, Italy, or Japan."

"But why does a winter in Southern California do an invalid so much good?"

"The change. The beneficial effects wear off with time.

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"And just one word more, while we are on the subject. I'd hardly do my old professor justice unless I mentioned that he lays that third factor in civilization, inherent mental capacity, to the climatic conditions, not of the present, but of the ancestral history of the past. But remember, the climate of, say, Greece, has not always been what it is to-day. Our Big Trees show, by an examination of their annual rings, the same story that the rocks tell,—and that history tells,—that there have been constant fluctuations of climate, within certain limitations. The records of geology lead us to believe that California and the Mediterranean countries have undergone the same climatic variations."

The next day the boys were so tired of sleuthing for the fire-bugs that they decided to join the others in a holiday and explore one of the neighboring peaks, leaving the burros and outfit at their camp of the night before. About noon, the trail ended abruptly at a peak of granite blocks each no larger than a foot-stool. Off to the left they could see a peak higher than the one immediately before them. It seemed to be a ridge of three peaks, theirs the middle one,

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and once on the ridge, they could pick a course along the crest.

A little further on, the trail narrowed till they could see a tiny lake on either side, and a stone's throw below, pools as clear as mirrors reflecting the twisted growth about their brims. Then Ace gave a shout, for down a hollow between two ridges to the north lay a patch of snow.

Sliding,—on their feet if they could manage it,—and snow-balling, the boys were surprised to find how short of breath they were at this elevation, a trifle over ten thousand feet, Norris estimated,—for on their steady upward plod they had not particularly noticed it, or had not attributed their slightly unusual heaviness to altitude.

They were therefore willing enough to rest on top, though even at noon the wind blew cold upon them. Stretching almost north and south before them rose the main crest of the Sierras, —peak after peak that they could name from the map. They could see for at least a hundred miles. First the wild green gorges that made the peaks seem higher, then snow-capped and glacier-streaked altitudes rising one above another till they faded into purple nothingness.

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They did their climbing single file, with arms free, having disposed of their lunch at timberline. But where Norris had led the way up, Pedro was the first to start back. "Come on, why not take a short cut?" he shouted in competition with the wind.

"All right." Norris stepped on a rock at that moment that turned with him, barely escaping a wrenched ankle. He kept his eyes on his footing for some moments after that. It was therefore not surprising that he did not notice where Pedro was leading, till the latter called:

"Why, there's our lake, isn't it?"

The way began to be all bowlders, larger and larger ones. "Here, that isn't the way we came," cautioned Norris.

"I know it," Pedro assured him, "but see, Mr. Norris, we're just going around this middle peak instead of over it."

"Better not try any stunts," warned the Geological Survey man. Had he been by himself, he would have gone straight back till he came to the way they had gone up. But the boys were tired, and he hated to ask them to retrace their steps. Besides, he did not want

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to discourage initiative in the Spanish boy.

But soon they found themselves scrambling over slabs so high that they had to take them on all fours, clambering over one as high as their heads, then letting themselves down into the cranny between that and the next.

"We sure never came over anything like this!" the rest of the party began complaining. But on they scuttled, leapt and sprawled, no one finding any better way.

"Hurry, there's our lake!" shouted Pedro finally. "I'll bet if I could throw a stone hard enough, it would scare the fish."

But Norris spoke in alarm: "We couldn't see any lake on the trail going up. On the contrary, we saw the peak to our left.—Don't you remember? Now see! That peak is on our *right!*"

"Fellows, we are on the wrong side of this ridge," he decided. "And what is more, instead of going back down the middle crest, we have gone clear on to the third peak." (For the ridge was a three peaked affair, the middle being the lowest.) "The best thing now is to circle around as near the top as we can go, till we strike the trail. If we keep circling, we are

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bound to strike it sooner or later. But let's not all go together, or we might start a rock-slide. Let's 'watch our step!' What would we do if one of you put his ankle out of commission?''

The boys had little breath to waste on comment. Probably none but Norris had any vivid realization of the danger they were in, but each fellow had a keen eye to keeping his footing. Rock-slides the three boys had never seen, but a sprained knee or a crushed foot was something they could understand.—Pedro also had a weather eye out for rattlesnakes, to whom these rocks would have been paradise if it had not been such a chill elevation.

As the sun sank lower and lower, they began secretly to wonder what it would be to have to spend the night on this windy peak, without even an emergency ration,—unpardonable overthought! They circled steadily, Norris now in the lead, the boys spreading out fan-wise as they followed, Pedro even getting clear to the foot of the granite where he thought he would have easier going through the woods, though he would also have a larger arc to traverse. He felt safer on solid ground, though had he measured, he might have seen that he had climbed as

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far in going down as did the others in circling around.

Once a huge bowlder that overhung a precipice rocked under Ted, and it was only by a swift spring that he saved himself. Many of the smaller rocks tipped warningly, and he frequently stumbled. How slow their progress seemed! How fast the sun was sinking in the west! And how astoundingly their shoes were wearing through! It was three hours later that Pedro, down in the edge of the woods, gave a shout and began waving his arms in the wildest manner. Then along the way that he picked in coming to meet them, Norris with his glasses could just make out the brown ribbon of the trail.

Fifteen minutes more and they were lined up ready for the homeward march, cured once and for all of short-cuts, and divided only as to whether it would be better to run, at the risk of a turned ankle, while there was light to see their footing, or walk, and have to go the last half of the way in darkness.

They finally did some of both, running where the trail lay free from stones, and eventually having to make their way by the feel of the

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ground under the feet, and the memory of the mountain meadows whose perfume they passed, and the sound of the creek to their right. The stars were out, giving a faint but welcome light that served as guide when finally they stumbled into camp, bone-weary but safe, and nothing loth to set all hands for a square meal before tumbling in.

Throwing some of their reserve supply of fuel on the fire-place, they soon had the home fires burning cheerily, and Pedro was demonstrating his can-opener cookery.

Next day a glitter from beneath the water of a rivulet high on the mountain-side, caught Ted's eye. Dipping with his tin cup, he brought up a specimen of sand and water. Could it be only mica that glistened so? Saying nothing to Ace, (for he remembered Long Lester's tale of salting a mine once when "the boys" wanted some one of their number to stand treat by way of celebration of his new-found riches,) he slyly slipped an aluminum plate from out the pack and began that primitive operation that used to be known as pan and knife working. Falling a little behind, he kept at it until he had separated out some heavy yellow grains that proved mal-

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leable when he set his teeth on them. It was coarse gold!

It was now time to announce his find, which he did to the amazement of all but the old prospector. A more careful inspection of the bend where he had found it proved it to be only the tiniest of pockets, though under their combined efforts that day it yielded what the old man pronounced to be about a hundred and fifty dollars' worth of dust. Still, even that was not to be sneezed at, as Long Lester put it, in terms of Ted's college fund,—for they all insisted on contributing their labor to his find. Ted, though, insisted equally that it be their stake for another camping trip.

Later that same day they came to the remains of an old hut, now overgrown inside and out with vines and underbrush. In one corner the old man unearthed what he pronounced to be the rusted mining tools of the early days. A fallen tree that lay across the doorway had to be chopped through and cleared away before they could enter, and on stripping a bit of the dry bark away for firewood, Pedro was puzzled to find what appeared like hieroglyphics on its nether side. He showed Norris, but what it

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could be he could not imagine, till Norris happened to try his pocket shaving mirror on it. Then, clear as carving, only inverted, they spelled out the legend:

"C L A M E N O T I S E — JUMPERS WILL BE SHOT."

These were evidently the letters that had been carved on the tree trunk—as they judged, about six feet above its base, and though the sap had long since obliterated the original, the bark still told the story where it had grown over the wound. By chopping through the log at that point and making a rough count of the annual rings of growth, they estimated that all this had happened forty years ago. What had become of the old miner? For such his tools acclaimed him. Why had he never come back? Had he been overtaken by bandits, robbed of his buckskin bag of dust, and murdered? Or had he struck a richer claim elsewhere?

They dug beneath what once had been his crude stone hearth, in the hope of buried treasure, but no such luck rewarded them, and finally they moved on up the mountainside, past vistas of green-black firs and yellow-green alders. As usual in these dry altitudes, the fiery sun of

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noonday had grown chill at sunset, the wind stopped singing through the pines, and the weird bark of a coyote seemed to accentuate the loneliness that the wilderness knows most of all when some abandoned human habitation brings it home to one.

But a heaped up bon-fire and a singing kettle soon drove the shadows from the circling mountain meadow that was to be their home for the night.

"Thet there cabin," drawled Lester, "sure made me feel as if I were back on my old stamping grounds. 'Minds me of the place where I once found a chunk o' glassy white quartz half the size of my head with flakes of color in it that netted me $200. I spent quite consid'able time hunting for the vein that came from, but I never did, nohow."

Norris explained to Ted and Pedro that a quartz bowlder will often be washed along a river.

They were awakened by the usual concert of he-haws, as the burros, who followed at their heels all day like dogs, (except when they got contrary,) woke the echoes with their loneliness.

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That day led them over another of the parallel ridges that comb the West flank of the Sierra, and into a precipitous canyon, over red sandstones and green shales, and slates of Tertiary formation, till they came to another hot spring and decided to pitch camp and all hands make use of the hot water. A natural bath tub and a smaller wash tub were found hollowed out of the stony banks, doubtless carved by whirling bowlders from the spring floods, and with the joy known only to the weary camper they performed their ablutions, filling the tubs, each in turn, by means of the nested pails. What grinding and whirling it must have taken, they reflected, as they felt the smoothness of their symmetrical bowls, to have hollowed these from the solid rock! With accompaniment of drift logs tumbling end for end, as the river rose and foamed beneath the thousand trickles of melting snow!

"Ever been up here in winter?" Ace asked the old prospector.

"Not exactly here, but I been places almighty like it."

The old prospector told them how, in the days of the 49ers, (vivid recollections of which

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his father had collated to his youthful ears,) the Mexicans had been treated in a way they had practically never forgiven. The land was free. Discovery and appropriation of a mining claim gave title, provided it was staked out and a notice scratched on a tin plate affixed to the claim stake, and likewise provided that the size of the claim accorded with the crude ruling for that region. Fifty feet was generally allowed along a river, or even a hundred where the claim was uncommonly poor and inaccessible, though where it was uncommonly rich, miners were sometimes restricted to ten square feet apiece.

But Mexicans were generally refused the benefits of the gold claims, the "greasers" often being ejected by force of arms from the more valuable claims. Sometimes they were given three hours' grace for their getaway. More within the letter of the law, a tax was imposed on alien claim holders, but at first such a heavy one that it was practically prohibitive. This resulted in border warfare, and to many of the Mexicans originally on the land, abject poverty. At the Mexican dry diggings, which, with their bull rings and fandangoes, had sprung up here and there in the foothills, there was bloody de-

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fiance of the tax collector. Other groups became highwaymen, who robbed and murdered the blond race whom they felt had cheated and maltreated them, stabbing from ambush, or organizing into bands of road agents, who systematically robbed miners of their dust and stage drivers of their express boxes, and as often murdering their victims.

There was Rattlesnake Dick, among other desperadoes, who with two gangsters, Alverez and Garcia, had terrorized the gold diggings till, five years after the gold rush, he had been killed by a rival bad man.

Ace was so tired, he rested again that day, merely bringing his bi-plane in to the new camp site.

As Long Lester drawled over the camp fire, the drowsy boys lived again in the days when a pinch of gold dust in a buckskin bag was currency, and red shirted miners gambled away their gains or drank it up, in a land of hot sunshine and hard toil, where a tin cup and a frying pan largely comprised their bachelor housekeeping apparatus, their provender such as could be brought in on jingle belled mule teams, their chief diversions the occasional open air

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meeting or the lynchings of their necessarily rough and ready justice.

The more adventurous always abandoned a moderate prospect for a gold rush. Some of them made rich strikes; others ended their days in poverty, after all.

The fire drowsed to a bed of red coals and the old man's chin was sunk in his whiskers, but still he talked on, almost as if in his sleep, and still the boys propped their eyes open while they stowed away in their memories pictures of the pony express riders, of the horse thieves branded—in this land of horseback distances—by having their ears cut off, and of the unshaven miners, sashes bound Mexican fashion around the tops of their pantaloons, the bottoms thrust into their boots, slouch hats shading their unshaven faces, as they panned the glittering sediments or built their sluices, with rocks for retaining the heavy particles of gold washed over them.

Gold had been found in a belt 500 miles long by 50 wide,—and it was a cherished myth that somewhere along the crest of the range lay a mother lode.

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But that, Norris told them, was not the way of the precious metal. The "mother lode" was a myth.

The next day the two boys started once again to look for the incendiaries, for when Ace set out to do a thing, it was do or die.

Pedro had now overcome his fear for bears, Mexicans, and getting lost, but the too-gently reared youth had never conquered his nervousness at thunder storms. He meant to, though, for he had come to consider useless fears as so much surplus luggage. Just as when he was a small boy he had overcome his fear of the dark by going right out into it and wandering around in it till he felt at home in it, so now he meant to go right out into the next thunder storm that came, becoming its familiar, till he knew the worst, and no longer felt this unreasoning fear.

It was therefore with a certain satisfaction, (though coupled with an equally certain inward shrinking,) that as he scanned the skies for some sign of the returning bi-plane, he noticed, rising above a green fringe of silver firs across the canyon, the snowy cumulus of a cloud. This was about an hour before meridian, the

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time the usual five minute daily noon thunder storm began to gather.

But to-day he noted with surprise, not unmixed with alarm, that beyond this one small mountain of the upper air,—so like the glacier-polished granite slopes beneath that it might have been a fairy mountain, swelling visibly as it rose higher and higher above the canyon wall,—beyond this for as far as he could see were other domes and up-boiling vapor mountains. What did it betoken? A cloud-burst?—For Sierra weather is not like that in the Eastern mountain ranges, and such an assemblage sweeping along the slopes and flying just above the green firs of the lower forests must mean something beyond ordinary in the line of weather.

Had he known more of Sierra weather, he would that instant have given up his plan of being out in this specimen, but his new-born resolution was still strong within him, and—he did not know.—One above another for as far as he could see the pearl-tinted billows rose from among the neighboring peaks, swelling visibly as it rose higher and higher. Then they began floating together, the cloud canyons taking on

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grayer tints, then deep purplish shadows, and their bases darkened with the weight of their vapory waters.

With the sudden reverberation of a cannon shot, the first thunderbolt crashed just ahead of a blinding zigzag of lightning, and echoing and reëchoing from peak to granite peak, with ear-splitting, metallic clearness, it rang its way down the canyon walls, till the echoes died away. Soon the big drops began spattering loudly on the granite slopes, till the drenched boy, bending his hat-brim to the on-slaught, lost his footing in the new slipperiness of the smooth, sloping rocks, down which a solid sheet of water now raced, dimpling silver to the pelt of each additional drop.

Before he could collect his scattered wits, another thunder peal came cannonading at the mountain mass, and almost behind him a solitary old fir tree shook the ground with its fall. Another fir was slivered into huge splinters that flew—fortunately for Pedro—just too far away to hit him. Then loosened rocks and bowlders began bounding and re-bounding down the cliffs till their thunder seemed as loud as that from the heavens.

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The lightning struck now here, now there, among the peaks, attracted by veins of mineral.

Uneasy on account of the flying stones and falling tree trunks, Pedro was about to take shelter by crawling under a shelving rock when the rock itself was dislodged by a flash of lightning, and went pommeling to the slide-rock on the slope below.

Seemingly all in the same breath, the rock-slide started, with a roar as of fifty express trains, as it seemed to Pedro's long-suffering ears. An electric storm always does start snow and rock slides.

As if that had been the grand climax, the storm ceased almost as suddenly as it had begun. By his watch it had not been an hour, but from the amount of damage done to both the geography and Pedro's feelings, it might have been a year, or a century.

"But here we are, safe still," he told himself in surprise. "After this experience, I don't believe there is anything worse anywhere to look forward to. So what's the use of worrying about anything any more? Ever!"—The experience had been worth while. Just how he was

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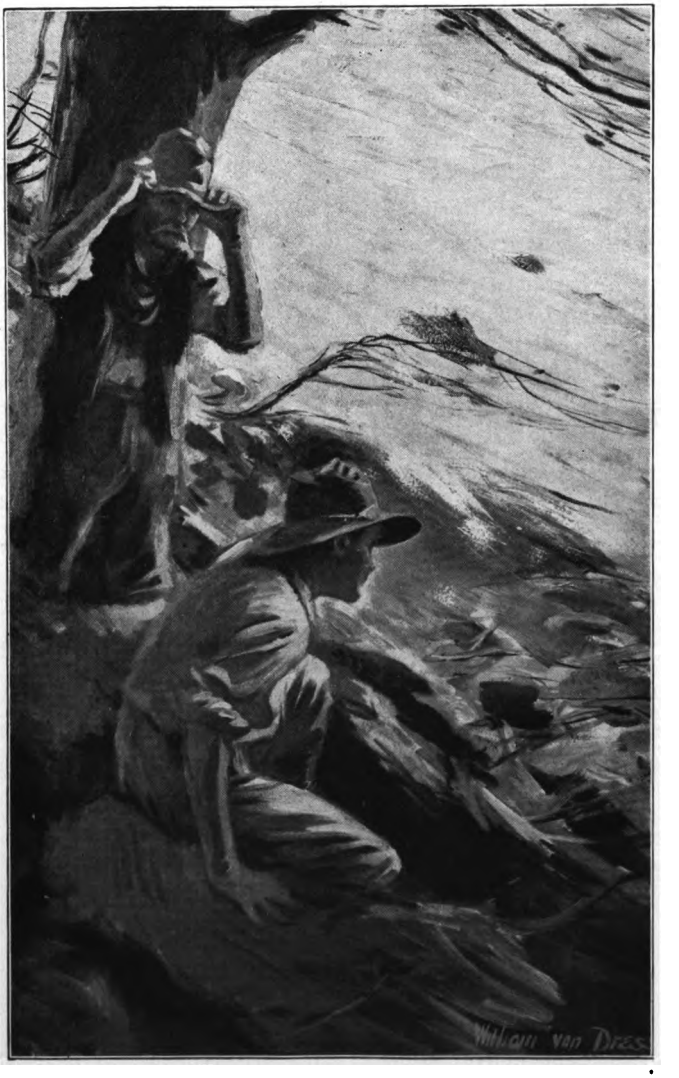

Loosened rocks and boulders began bounding down the cliffs.

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to make his way back to camp was another question.

With the mountainside a choice between slippery, dripping rock slopes and sliding mud, fallen tree trunks and soggy forest floor, it was no mean test he had to meet. But as the irrepressible California sun once more burst forth in golden glory, the clean-washed air was all balsamic fragrance, every leaf and fir needle held at its tip a drop of opal, and the birds,—emerging from the holes in which they had safely hidden, those who survived,—burst into happy gratitude.

As luck would have it, an hour before the storm broke, the two boys had sighted the smoke of a camp-fire hidden away down in the bottom of a gulch, with slide rock to cut off any approach from the main ridge. Flying low, they could actually identify fat Sanchez and his two companions, who had their pack burros with them. It seemed too good to be true! But before they could decide whether to sail down and try to capture them themselves, or to go for Long Lester, the on-coming storm began to set them careening, and they had to fly out of the

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elements at right angles to the storm's approach.

Returning three hours later with the old ex-deputy sheriff,—it was a spot not to be mistaken,—Ace gazed in complete stupefaction at the gulch where the Mexicans had been encamped. For there was now nothing there but slide-rock!

The dust that still grayed the atmosphere spoke clearly of the catastrophe.—And there would not have been one chance in a million of their escaping. That they had not done so, their non-appearance anywhere in the neighborhood bore abundant testimony.

The Mexicans had been captured by those same natural forces they had tampered with when they set the forest fires.—The little camping party was free to return as soon as their time was up.

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GLOSSARY

Archeopteryx (ar′chē-ŏp′tē̤-rĭks), a fossil bird that had teeth and whose spinal column extended into the tail.

Archeozoic (ar′che-ō̤-zō′ĭc), the era in which the simplest forms of life originated.

Basalt (bă-sąlt′), a dark brown or black igneous rock.

Calcite (kăl′sīt), calcium carbonate, a rock that includes limestone and marble.

Cambrian (kăm′brĭ-ĕn), the first period of the Paleozoic era,—that of the first abundance of marine animals.

Carboniferous (kär′bŏn-ĭf′ĕr-ŭs), producing or containing coal.

Cenozoic (sē′nō̤-zō′ĭk), the age of mammal dominance. It included the last great ice age, the time of the transformation of apes into man, and the rise of the higher mammals.

Comanchian (kō-măn′shŭn), that period of the Mesozoic era that gave rise to flowers and the higher insects.

Cretaceous (krē̤-tā′shŭs), that period of the Mesozoic era that gave rise to the primitive mammals.

Dinosaur (dī′nō̤-sąr), an order of extinct reptiles, of which there were a dozen varieties, mostly lizardlike and of huge size.

Exhume (ĕks-hūm′), to dig out of the ground, or in the case of a fossil, to take out of its place of burial in the rock.

Faulted (fąlt′ed), interrupted continuity of rock strata by displacement along a plane of fracture, generally caused by an earthquake.

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Formative (fôrm′ă-tĭv), the era of the birth and growth of the earth out of the spiral nebula of the sun, the beginnings of the atmosphere and hydrosphere, and of the continental platforms and ocean basins.

Fossil (fŏs′sĭl), the remains of plants and animals of prehistoric times, now found embedded in the rocks.

Psychozoic (sī′kō̆-zō′ĭk), the era of man, including the time during which man attained his highest civilization (perhaps the past 30,000 years), to the present.

Geology (jē̆-ŏl′ō̆-jў), the history of the earth as read in the rocks.

Geyser (gī′sẽr), a boiling spring which periodically sends forth jets of water, steam and gas.

Glacier (glă′shẽr), a slow moving river of ice, remnant of the last ice age, generally found flowing down the mountain peaks.

Granite (grăn′ĭt), a granular rock consisting of quartz, mica and feldspar,—the material of the original crust of the earth.

Gypsum (jĭp′sŭm), the mineral from which plaster of Paris is made.

Ichthyosaurus (ĭk′thĭ-ō̆-sa̤r′ŭs), an extinct fishlike reptile of huge size.

Igneous (ĭg′nē̆-ŭs), produced by the action of fire (i.e., rock).

Jurassic (jū̆-răs′sĭk), that period of the Mesozoic era that gave rise to birds and flying reptiles.

Lava (lā′vă), the melted rock ejected by a volcano.

Limestone (līm′stōn), a rock due in the main to the accumulated débris of plants and animals, especially to the shells of marine animals.

Lithosphere (lĭth′ō̆-sfẽr), the rocky crust of the earth.

Mesozoic (mĕs′ō̆-zō′ĭc), the era of reptile dominance, in which

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occurred the rise of dinosaurs, birds and flying reptiles, flowers and higher insects, and primitive mammals.

Metamorphic (mĕt'ă-môr'fĭk), recrystallized by heat (i.e., a rock), or changed by pressure.

Metamorphose (mĕt'ă-môr'fōs), to change into a different form.

Miocene (mī'ō-sēn), that period of the Cenozoic era when apes were transformed into man.

Paleozoic (pā'lē-ō-zō'ĭk), the era of fish dominance, in which occurred the first abundance of marine animals, the first known fresh-water fishes, the first known land floras, the first known amphibians, the first insects and the first accumulations of coal.

Proterozoic (prō'tĕr-o-zō'ĭk), the age of invertebrate dominance, containing an early and a late ice age.

Reconnaissance (rē-kŏn'nĭs-sāns), a preliminary survey.

Scarp (skärp), declivity.

Shale (shāl), a fine-grained, layered, sedimentary rock, generally easily crumbled.

Silica (sĭl'ĭ-kă), a form of quartz.

Stalactite (stă-lăk'tīt), a pendant cone of calcium carbonate deposited by dripping water (as in a cave).

Stalagmite (stă-lăg'mīt), a deposit (on the floor of caves) resembling an inverted stalactite.

Strata (strā'tă), layers of rock or earth.

Striated (strī'ā-tĕd), marked with fine grooves or lines of color.

Triassic (trī-ăs'sĭk), the period that gave rise to dinosaurs.

Triceratops (trī'cĕr-ă-tŏps), a fossil giant lizard.

Uplift (ŭp'lĭft'), an upheaval of rock strata.

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KEY TO GEOLOGIC TIME

Archeozoic era. (Protoplasms.)

Proterozoic era. (Invertebrates.)

Paleozoic era. (Fish.)
- Cambrian period.
- Ordovician period.
- Silurian period.
- Devonian period.
- Mississippian period.
- Pennsylvanian period.
- Permian period.

Mesozoic era. (Reptiles.)
- Triassic period.
- Jurassic period.
- Comanchian period.
- Cretaceous period.

Cenozoic era. (Mammals.)
- Oligocene and Eocene time.
- Pliocene and Miocene time.
- Pleistocene time.

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